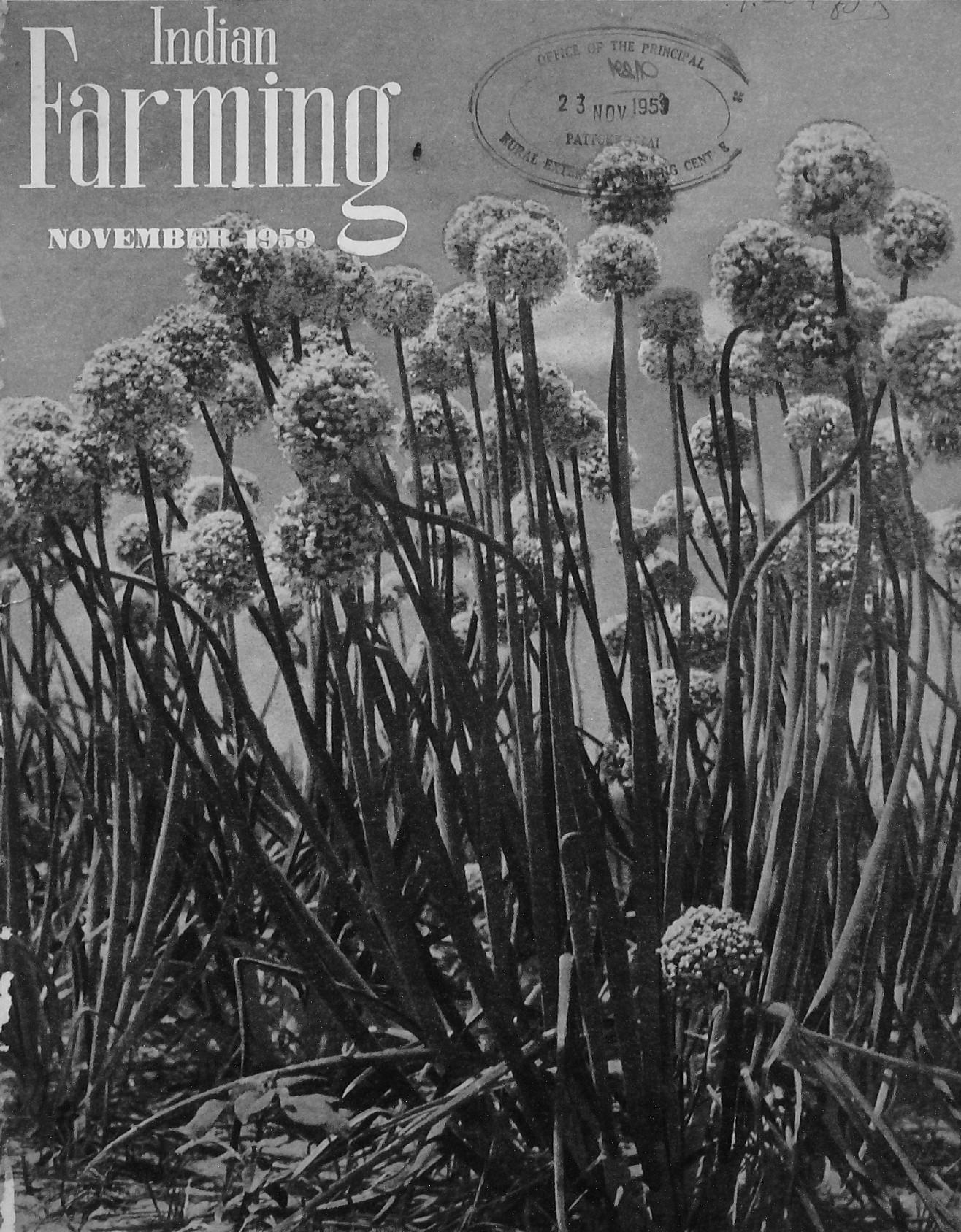
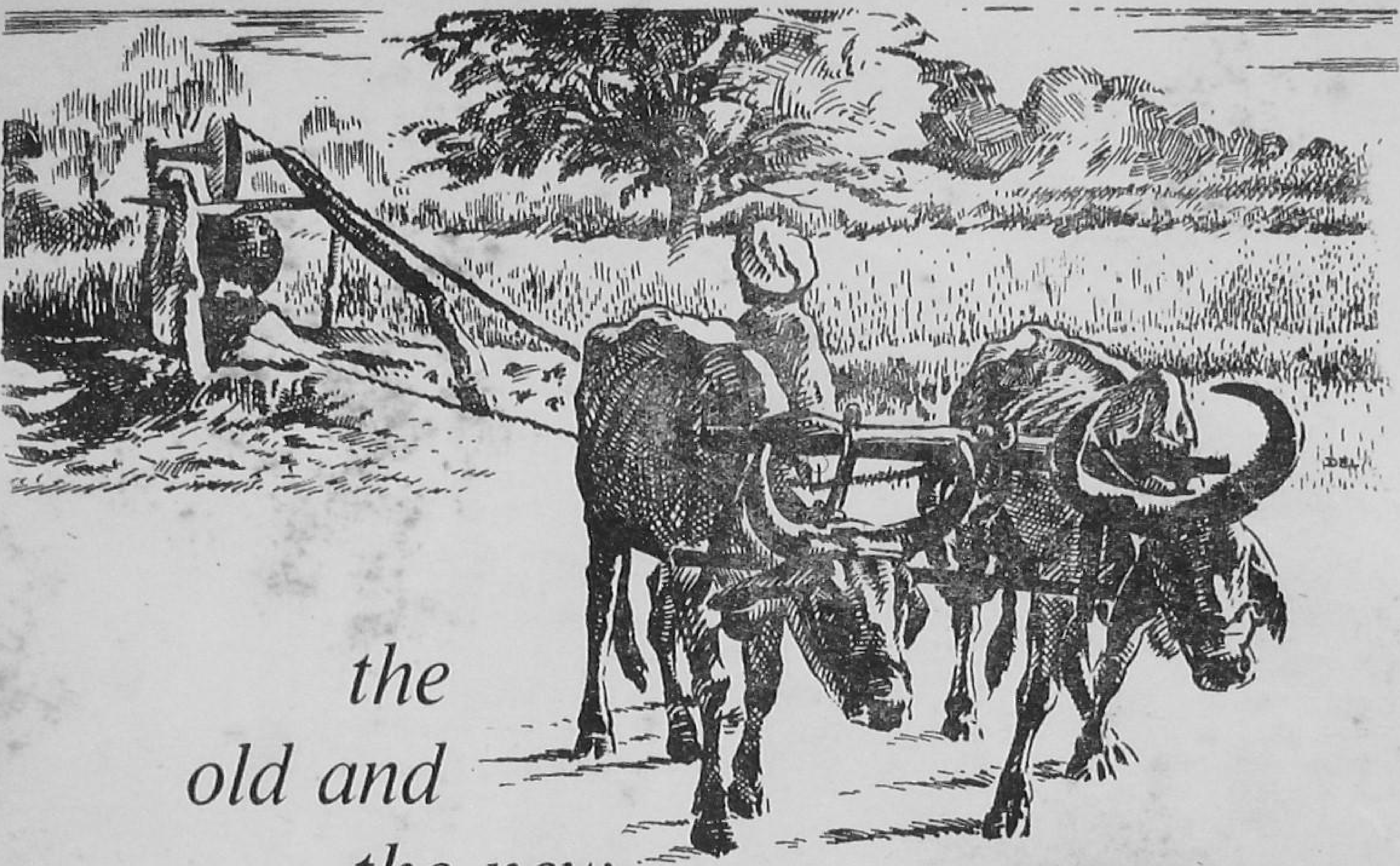
Indian Farming

NOVEMBER 1959

OFFICE OF THE PRINCIPAL
23 NOV 1959
RURAL EXTE... CENTRE





the old and the new

Food is India's most urgent problem. To increase our yield we *must improve* methods. Gone are the days of the Persian wheel...the antiquated pulley...the use of bullocks for drawing water!

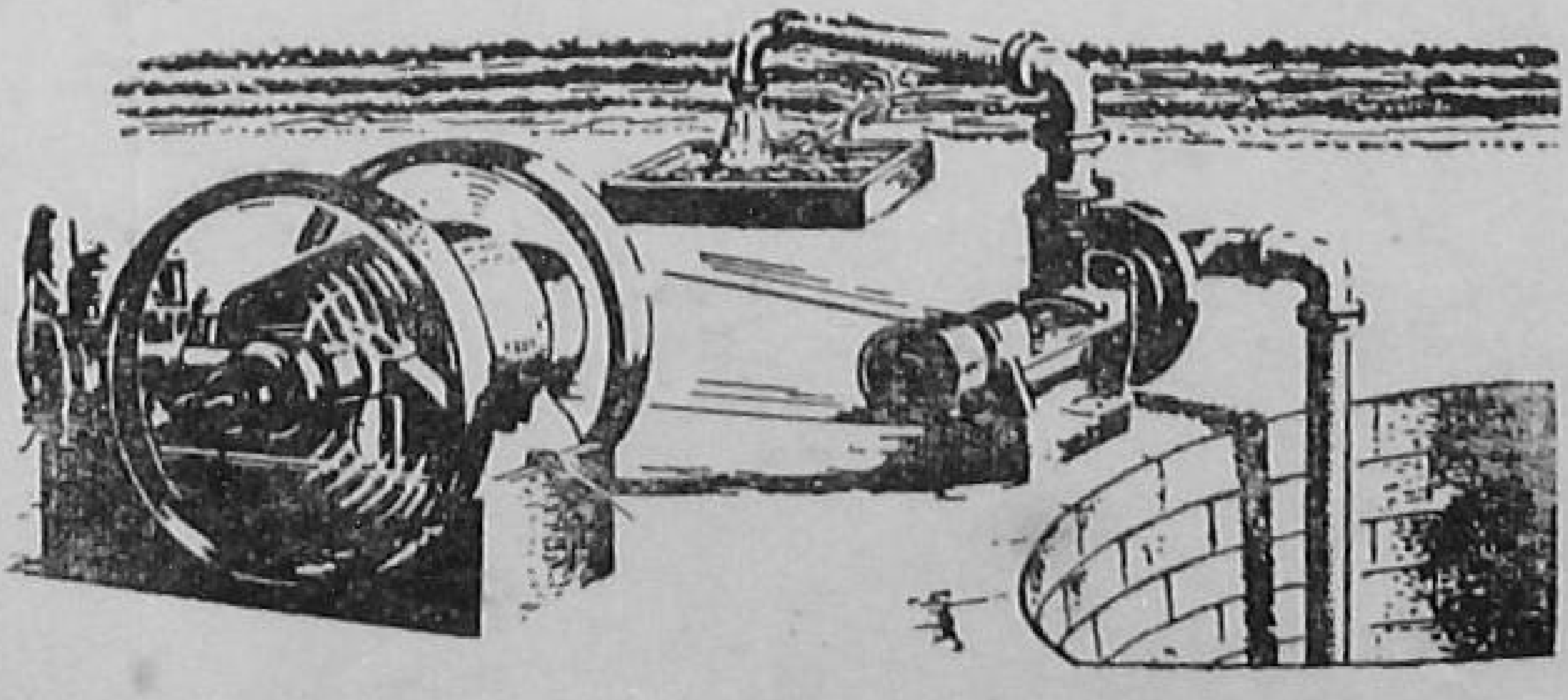
Today, thanks to Ruston engines and pumps, there is no need to depend on the vagaries of nature, or to waste *time* and *energy* by using age-old methods.

Thousands of farmers all over India now depend on Ruston, because they know that these engines and pumps are manufactured in India to suit our conditions.

Ruston engines and pumps are absolutely dependable; they are backed by the experience of a *hundred years !*
And remember—everytime you invest in a Ruston you also invest in Greaves after-sales service!

RUSTON

HORIZONTAL OIL ENGINES AND CENTRIFUGAL PUMPS



Sold & Serviced by GREAVES

GREAVES COTTON & CO LTD.

Bombay • New Delhi • Madras • Ahmedabad
Bangalore • Coimbatore • Kanpur •

GC/59-41

NOVEMBER 1959

Vol. IX No. 8

OUR COVER

A fine onion seed crop. It is not difficult to obtain a seed-yield of 1,000 pounds per acre, provided the crop is raised in a well-prepared and manured field and is properly spaced.

Photo by H.K. Gorkha

EDITORIAL BOARD

Dr. M. S. Randhawa, Vice-President, Indian Council of Agricultural Research (*Chairman*); Dr. J. S. Patel, Agricultural Commissioner with the Government of India; Shri Lakshmi Sahai, Animal Husbandry Commissioner with the Government of India; Dr. B. P. Pal, Director, Indian Agricultural Research Institute, New Delhi; Shri J. V. A. Nehemiah, Extension Commissioner, Ministry of Food and Agriculture; Shri S. K. Mirchandani, Secretary, Indian Council of Agricultural Research; Shri M. G. Kamath, Production Specialist, Extension Wing, Ministry of Food and Agriculture; Shri Harkirat Singh, Editor, Indian Council of Agricultural Research.

Chief Editor & Production Specialist
Prem Nath

Business Manager
K. E. Sankaran

SUBSCRIPTION RATES

Annas 12 or 75 nP per copy
Rs. 9 for 12 issues

Indian Farming

OFFICE OF THE PRINCIPAL
23 NOV 1959
PATTUKKOTTAI
RURAL EXTENSION TRAINING CENTRE

CONTENTS

Editor's Page 2

Farmer of the Month—*Harkirat Singh* 3

New Light on Areca's Pest Enemies —*G. B. Pillai* and *Chandy Kurian* 5

Water Hyacinth Must be Controlled —*Dharam Vir Khanna* 8

Broilers Do Have a Future in India —*N. S. Garewal* 10

Coriander And Its 3 Diseases —*B. G. Nikam, S. N. Kulkarni* and *F. K. Pawar* 12

Preventing Infectious Diseases of Livestock —*S. S. Khera* 14

Bihar Gets a Better Jute —*M. D. Nandkeolyar* and *S. A. Dadlani* 17

In Mysore, They Grow *Baje* For Cash —*G. V. B. Naidu* 19

Why Not Try Buffel For Fodder?—*J. S. Saxena* 22

How Denmark Ensures Hygienic Milk to Consumers —*Bishamber Dass Bahl* 23

Newsletter From States—*N. S. Money* 26

Planting Paddy the Kudige Way—*M. G. Ponnappa* 28

What Makes For Quality in Farmyard Manure —*R. S. Bhatty* 29

Tea Cultivation in Kangra Needs Rejuvenation —*Anup Singh Sandhu* 31

A Good Service Programme Makes Farm Machinery Live Longer —*R. P. Saxena* 35

The Advantages With *Gliricidia*—*A. S. Venkata Rao* 38

U.S.S.R. Evolves New Irrigation Techniques —*M. Pavlov* 39

***Editor*: Harkirat Singh**

ISSUED BY

THE INDIAN COUNCIL OF AGRICULTURAL RESEARCH
NEW DELHI

Any article or illustration published in "Indian Farming" may be reproduced in any periodical provided due acknowledgment is made to the source

RABI CAMPAIGN 1959

THIS year's *rabi* campaign to step up production from food crops is already in full swing, and Teams of Helpers are regularly visiting the villages on their advisory mission. Reports indicate that active co-operation and participation of farmers are readily forthcoming; that certainly augurs well for the realization of the objective. Compared with last year, the nature of activities this time will be slightly different, and efforts will be mainly aimed at saturating areas with improved practices and high-yielding varieties demonstrated and found successful last year.

The campaign has some refreshingly new features. Farm families in a few villages in each Village Level Worker circle will be helped in planning their programmes for the season. Besides, at least one farm of about five acres will be earmarked in every such circle with the co-operation of the owner and, with intensive technical guidance from the Helpers, will be used as "model" for the rest of the village community and the farmers of the neighbouring villages.

Another is inclusion of chemical weeding in demonstration plots. This, because chemical weeding has been found cheaper and more effective than hand-weeding. Spraying of 2, 4-D at one pound in 60 gallons of water will be carried out with foot-sprayers after six weeks of the sowing of the wheat crop.

Then, there are "Castration Fortnights" meant to also touch upon cattle improvement in the villages. All the field staff of the Animal Husbandry Departments will go from village to village and perform on-the-spot castrations of undesirable bulls and male calves surplus for breeding purposes.

The steps to increase production will be aptly reinforced by a beginning towards long-range planning. Legumes in the rotation and use of green and organic manures will be popularized among farmers. Legumes would not only help improve soil fertility, but will also provide succulent feed for the farmer's cattle and improve milk production. Better crops and better incomes would be the obvious results, the urge to improve living standards following close on the heels. This is a special feature of the campaign this year: in this way, the campaign spirit is sought to be kept alive to be turned to good account in all such future programmes.

HOUSEWIFE MAKES GOOD SUCCESS OF POULTRY-KEEPING

by

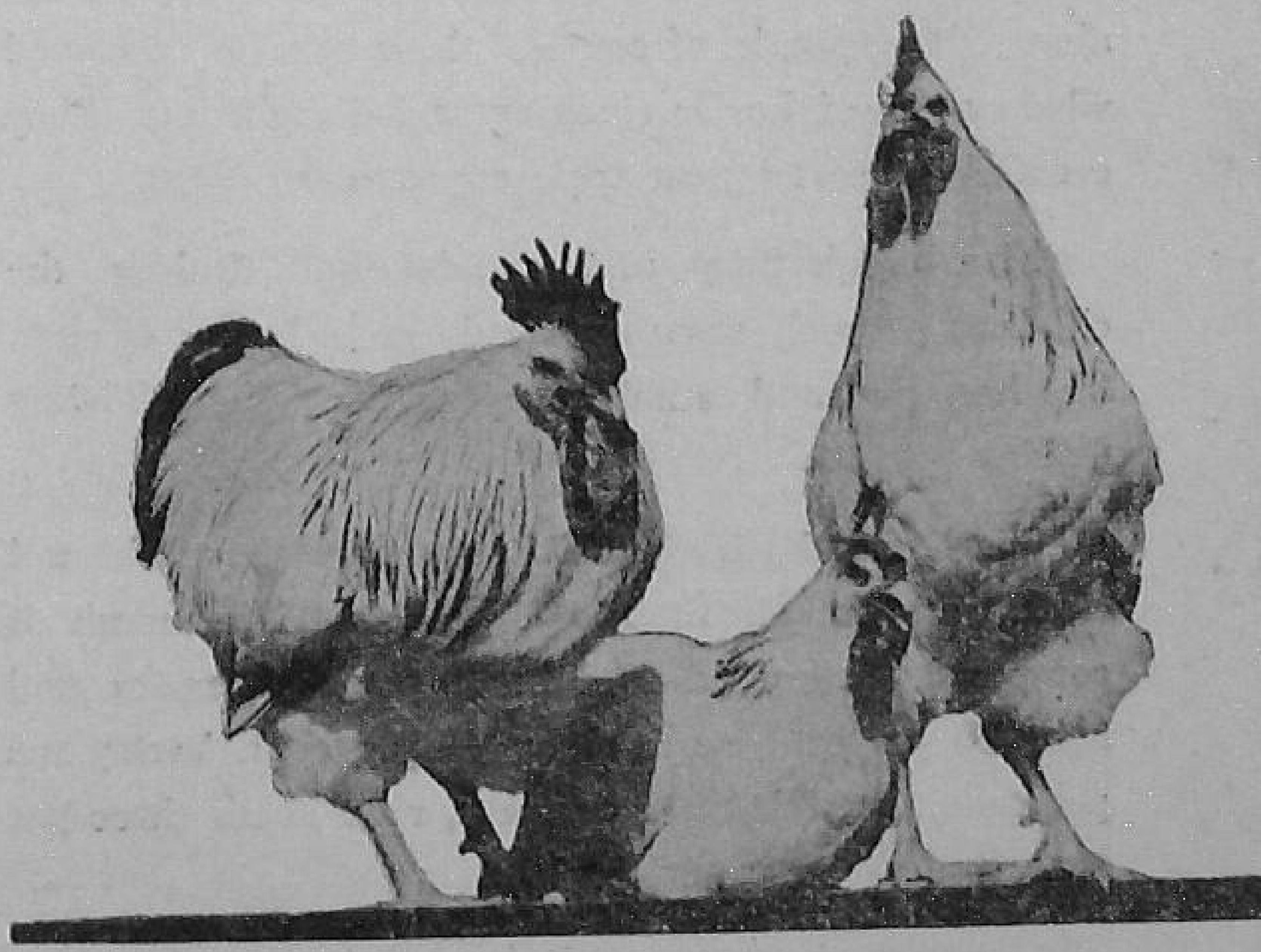
Harkirat Singh

A FEW days back, I met a housewife who has proved surprisingly good at poultry-keeping in a comparatively short time. She is Mrs. Rajindar Singh of Delhi Cantonment.

In December last year, she was an absolute novice, " guardian " of only nine birds—three Rhode Island Reds, three White Leghorns and three Brown Leghorns—bought by her husband, a colonel in the army, for fancy's sake; today, she has swelled the flock—a "colourful" assortment of breeds like Barred Plymouth Rock, Light Sussex, White Cornish, New Hampshire Red, Black Polish, Black Minorca and Aseel, to 80. I noticed a few birds that, in my view, would any day come out with flying colours at any poultry show.

An appreciative remark from me elicited from Mrs. Singh, what I realized, was the cardinal ingredient of her success formula: her eager pursuit of better ways of rearing poultry. " I do my own experimentation, I discuss with my husband (who too, I was told, is a keen poultry enthusiast and has collected some literature on the subject also) to get at the best, " she said. Pointing to the Poultry Development Officer of Delhi State, who accompanied me, she added thankfully, "I do not hesitate to run to him at the Government Model Poultry Farm nearby for expert advice whenever some problem tends to defy me."

She also explained to me that though this work was just a hobby to her now, her husband was thinking of taking up poultry-keeping as a business proposition after his retirement. She believes that then the present experience is bound to stand her in good stead.



The Light Sussex trio reared by Mrs. Singh that immediately catches the eye

A bird suffering from a cold gets a penicillin injection from Mrs. Singh. Daughter Kanchan (*left*) lends a helping hand.

LITTER SYSTEM

Mrs. Singh has confined ten birds each to houses of the size $5\frac{1}{2}$ feet × $7\frac{1}{2}$ feet, with runs $6\frac{1}{2}$ feet × $7\frac{1}{2}$ feet attached to them. A seven-inch deep layer of sawdust covers the floor of each house. Every morning, the sawdust is raked up so that the droppings, etc., get mixed with it. "I have found the system quite convenient, efficient and economical," Mrs. Singh informed me.

The houses are equipped with improvised laying-nests (made from discarded wooden packing-boxes) and mash hoppers. These are fixed with the wall, a little above the ground; of course, these can be removed whenever need be for cleaning and disinfecting. They certainly impart a neat appearance to the cages.

Mrs. Singh fully understands that feeding the chickens properly means a steady good basket of eggs. She has tried and found quite successful the following feeding pattern.

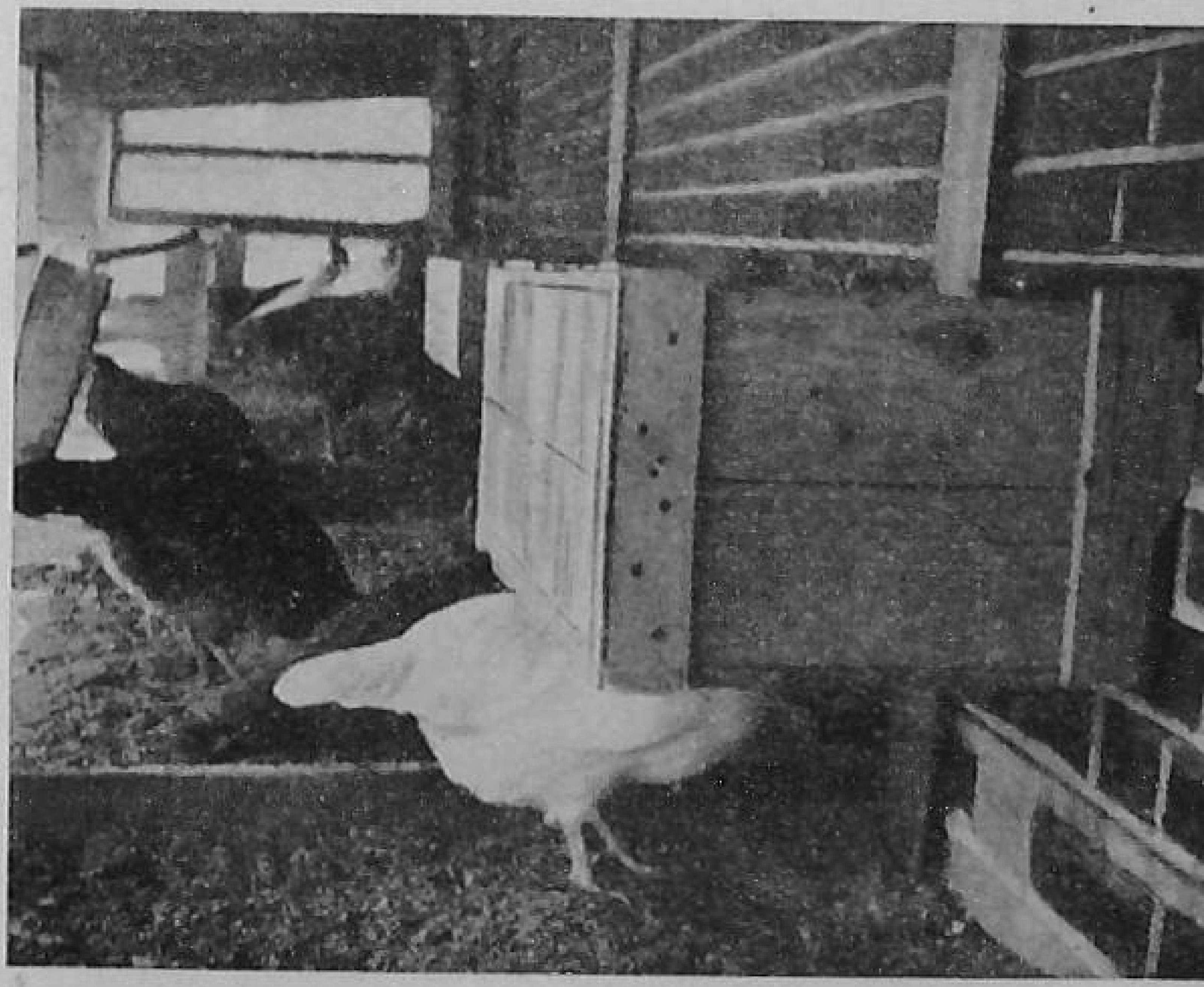
She keeps the birds well-provided with mash and clean water at all times of the day. The mash is composed of: groundnut cake 30 per cent, maize and *bajra* 20 per cent each, *chokar* 11 per cent, barley ten per cent, meatmeal five per cent, river shells three per cent, and salt one per cent.

Greens such as vegetable leaves, lettuce, berseem, *palak*, whatever is available, and kitchen leftovers are also incorporated into the mash. Whenever rice is boiled in the house, the water is not just sent down the drain, but is served to the birds. The birds are also given *lassi* twice a week.

As young chicks, the birds (in addition to the mash) got bread crumbs soaked in skim-milk to pick into during the night, shark-liver oil, and a daily helping of *lassi*. "They put on flesh so rapidly that I could actually see them grow," put in Mrs. Singh reminiscently.

HEALTH IMPORTANT

The health of the birds too gets its due share of Mrs. Singh's attention. She told me that after the chicks were just a week old, they were given "Sulphamezathine" solution as a precaution against coccidiosis. At one month came the inoculation against fowl-pox, and at $1\frac{1}{2}$ months the Ranikhet vaccination. "Phenothiazine" was used for ridding them of worms. A regular monthly application of "Gammexane" at the wings keeps ticks off.



This fine White Leghorn hen was about to jump into the nest for laying, but shyly hid herself when I focussed the camera on her

About 24 hens have already come into laying, producing an average of 16 eggs daily. To my query "How do you dispose these of?" Mrs. Singh humorously replied, "At the moment, these are only earning me popularity among friends and relatives. But, I must now think of an economic disposal as the production is gradually increasing," she added laughingly.

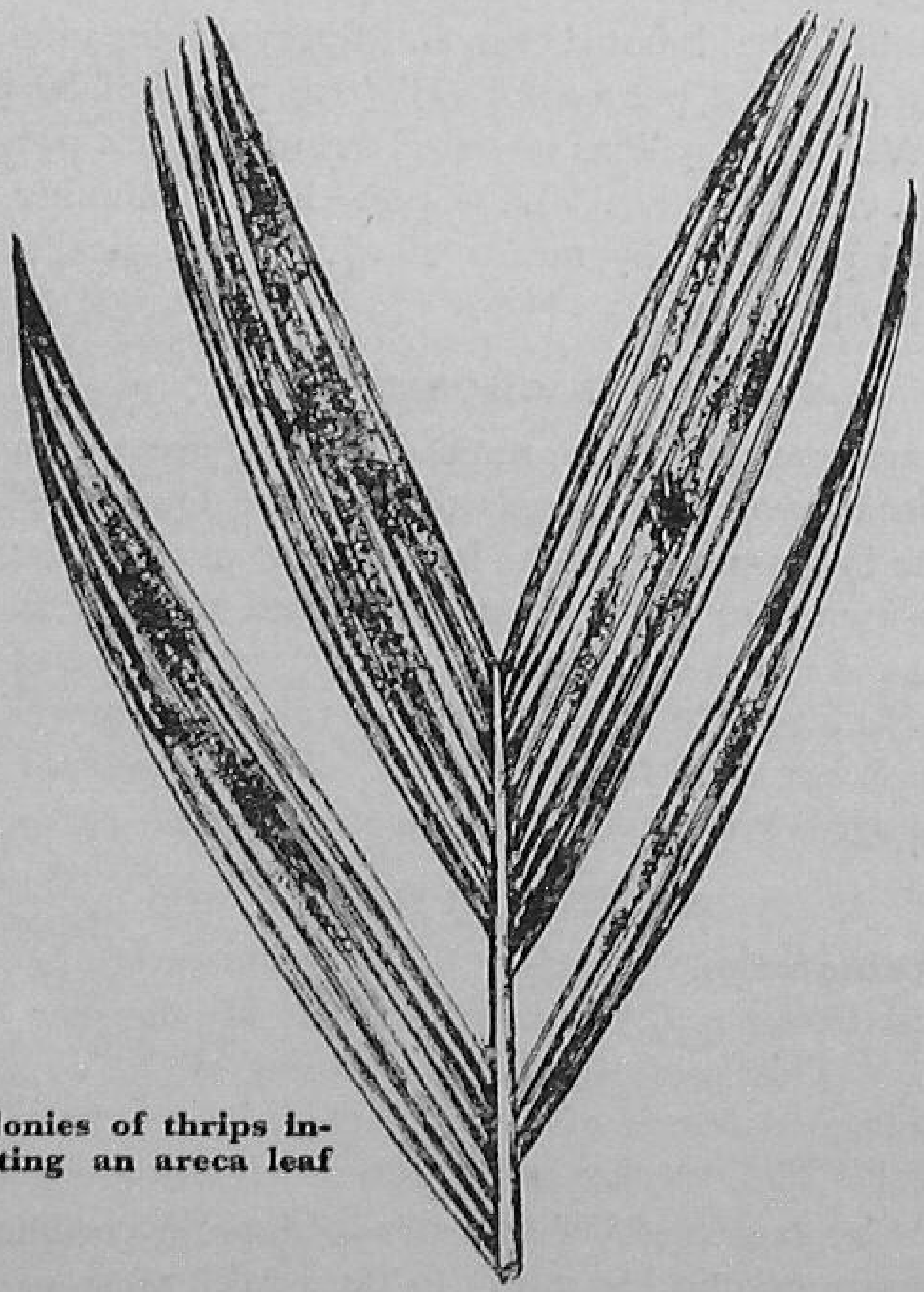
New Light On

Areca's Pest Enemies

by

G.B. Pillai *and* **Chandy Kurian**
Central Coconut Research Station
Kayangulam

THE areca palm was reported, till recently, to be fairly free from insect pests, except for a few scale insects and beetles. But recent studies have revealed that considerable damage to the arecanut crop is caused by a number of insect and non-insect pests. Some of these pests, which are described below, appear sporadically in certain localized areas and cause serious damage during certain seasons, while others occur throughout the year.



Colonies of thrips infesting an areca leaf

White ants or termites cause very serious damage to arecanut seedlings and seed-nuts in the nursery. The common species observed is of the genus *Odontotermes.* These also attack the bark of grown-up palms. Termites generally attack seedlings through the collar portion. The first visible symptom of attack on seedlings is the wilting of the central shoot; in severe cases, this is usually followed by the death of the seedling.

Removal of dry wood, rubbish, etc., from the nursery bed prior to sowing and covering the nuts with a layer of river sand instead of soil, are some of the preventive measures. Dusting of BHC, "Chlordane" or "Aldrin" on the soil before sowing nuts is an effective control measure.

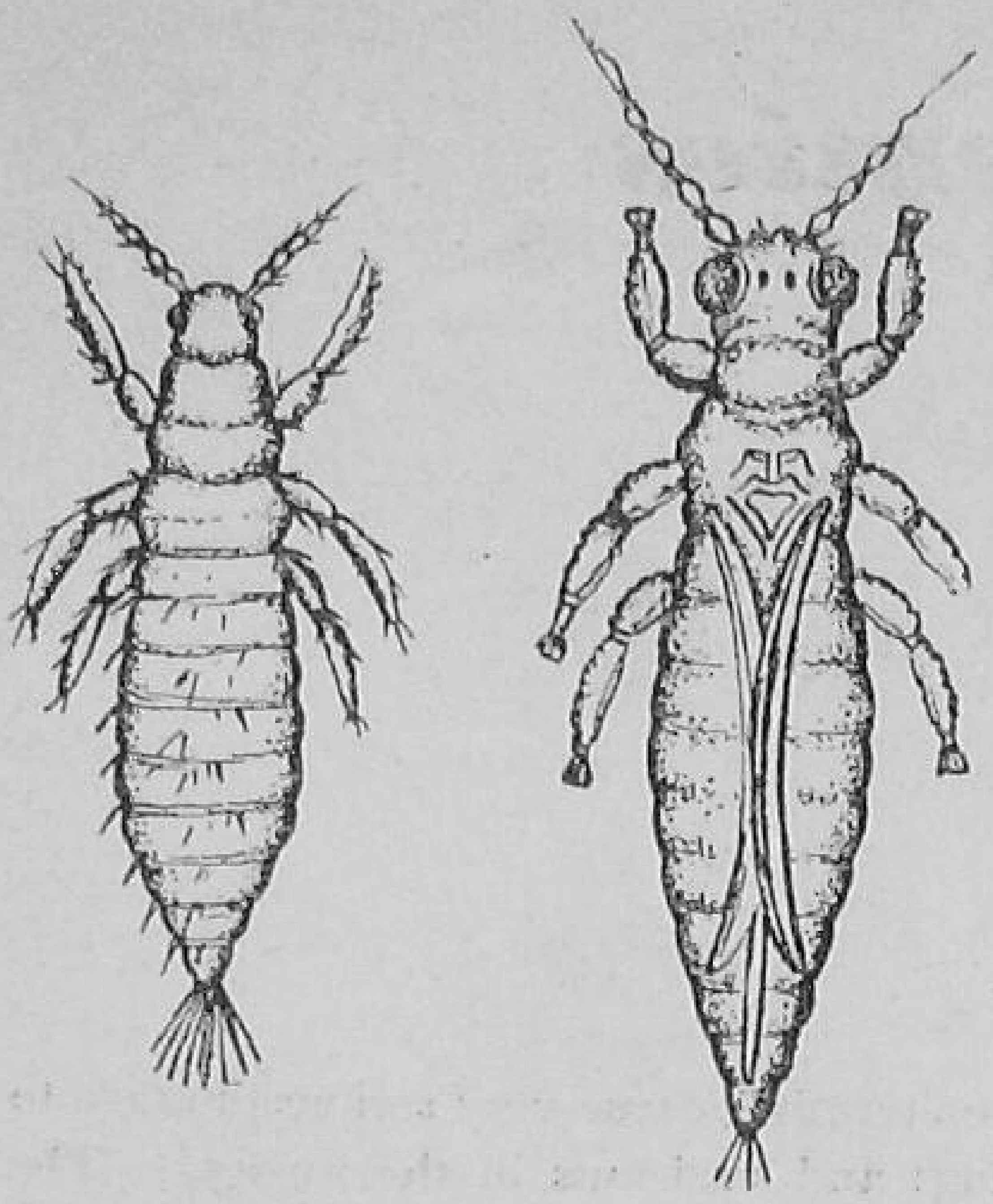
THRIPS

Thrips (*Rhipiphorothrips cruentatus* Hood) has been observed in large numbers on the leaves of areca palms. It has also been observed on several other host plants such as grapevines, crotons, etc. The adult thrips live on the lower surface of areca leaves in colonies along with their young ones. The leaves infested develop small, pale silvery blotches due to the feeding activity of the thrips. If the density of population of the pest is sufficiently heavy, these small blotches coalesce and the entire leaf becomes blotched. Spraying with some contact insecticide like tobacco decoction or an organophosphorous insecticide such as "Parathion" or "Malathion", helps exterminate this pest.

BUGS

Capsid (Mirid) bug. The reddish brown capsid bug, *Carvalhoia arecae,* is another pest of arecanut palms in South India. It is usually seen inside the angles formed by the tender central spindle and the older leaves.

Both the adults and young ones suck up sap from the foliage. The central shoot, when infested seriously, does not open easily. When unfolded, they show linear dried-up patches. This pest is reported to have



Nymph (*left*) **and an adult thrips** (*right*)

been controlled by spraying fish oil rosin soap at one pound in eight gallons of water.

APHIDS

The aphid *Cerataphis lataniae* Boisd is found infesting the inflorescence and later the nuts, preventing the latter from developing and inducing the dropping of immature nuts. The aphids have the characteristic capacity of secreting a sugary fluid called "honey dew". Attracted by this, ants herd together and establish a sort of animal association called symbiosis (living together). Honey dew is so universally relished by ants that it has been described as their "national dish".

These aphids can be controlled by spraying the infested inflorescence with some contact insecticide. Control of the symbiotic ants will check further spread of the pest.

MEALY BUGS AND SCALE INSECTS

Several species of mealy bugs and scale insects have been observed on areca palms at different seasons of the year in different localities. They are important not only because of the damage they do, but also because they can be the potential vectors (carriers) of certain diseases of areca palms.

The mealy bug *Icerya aegyptiaca* Dougl. infests ripe arecanut bunches. Different stages of the pest are seen on the stalks and basal regions of nuts. This mealy bug is distributed on a variety of host plants such as jack, croton, rose, etc. This pest can be controlled by spraying "Parathion" or "Malathion". The natural enemies of these pests like the predatory ladybird beetle, *Rodolia* sp. and some Hymenopteran parasites like the Pteromalid, *Pachycrepoides coorgensis* Mani and Kurian, play a vital role in keeping the pest population under control in nature.

Dysmicoccus brevipes Cske. is another coccid which occurs in large numbers around the stems of seedlings. These are carried with the seed-nut from which they emerge when the seedlings come up. Infestation by this pest often escapes notice in its early stages because this part of the seedling is normally covered by the soil. An effective method of control is to dip the base of the seedling in some contact insecticide at the time of transplanting.

Aonidiella orientalis Newst. is another serious coccid pest infesting arecanut seedlings. The infested seedlings show a sickly appearance and stunted growth.

Other coccids noticed in small numbers on areca palms are *Pinnaspis aspidistrae* S., *Phenacaspis dilatata* G., *Parlatoria* sp., *Coccus acutissimus*, etc. These pests are of rather minor importance. Spraying with some modern synthetic insecticide like "Parathion", "Malathion" or "Chlordane" emulsion will help control them.

LEAF-EATING CATERPILLARS

The black-headed caterpillar *Nephantis serinopa* Meyr., one of the major pests of the coconut palm, was also reported to be causing damage to areca leaves in some parts of Bengal. This has not been reported from anywhere else in India as a pest of the areca palm.

The methods of control include mechanical, chemical and biological. The mechanical method is to cut and burn the infested leaves. Spraying the infested palms with 0.2 per cent DDT (one pound of 50 per cent W.P. in 25 gallons of water) suspension has proved to be very effective. This pest has a number of natural parasites, by means of which biological control also is possible.

BAGWORMS

Bagworms have been noticed to cause great damage to areca leaves. Hundreds of these are found feeding on the lower surface of the leaves. The attacked leaves show numerous small holes. This pest appears to be the same as that infesting coconut palms, namely, *Manatha albipes* Moore. It can be controlled by spraying 0.2 per cent DDT of BHC. The bagworms are parasitized by a number of hymenopterous parasites.

BEETLES AND WEEVILS

Rhinoceros beetle. The rhinoceros beetle, *Oryctes rhinoceros* L., is a serious pest of the coconut palm. This pest was found causing slight damage to unopened fronds of areca palms in some parts of Bengal. The mechanical method of extracting the beetle by means of beetle hooks as done in coconut is not quite practicable owing to the weak nature of the

crown in the areca palm. The best method to combat the pest is to control its early stages seen in the manure pits and decaying organic debris by spraying BHC suspension (0.1 per cent).

Borer beetle. This pale grey beetle *Aroecerus fasciculatus* D. usually infests arecanuts stored in godowns. However, it has not been found on areca palms, though it is found on coffee. Infested nuts show small holes indicating the presence of grubs of the beetle. Fumigation of containers used for storage of nuts will help control infestation of the pest to an appreciable extent.

Cockchafer beetle. The grubs of the cockchafer beetle *Leucopholis lepidophora* Blanch have been reported to cause damage to the roots of areca palms in some parts of Mysore. An allied species, *Leucopholis coneophora* Burm., the "white grub" pest of coconut, is controlled by using five per cent BHC or "Chlordane" dust at 56 and 28 pounds per acre, respectively. The insecticide is first spread on the soil and is incorporated into it by tilling or ploughing.

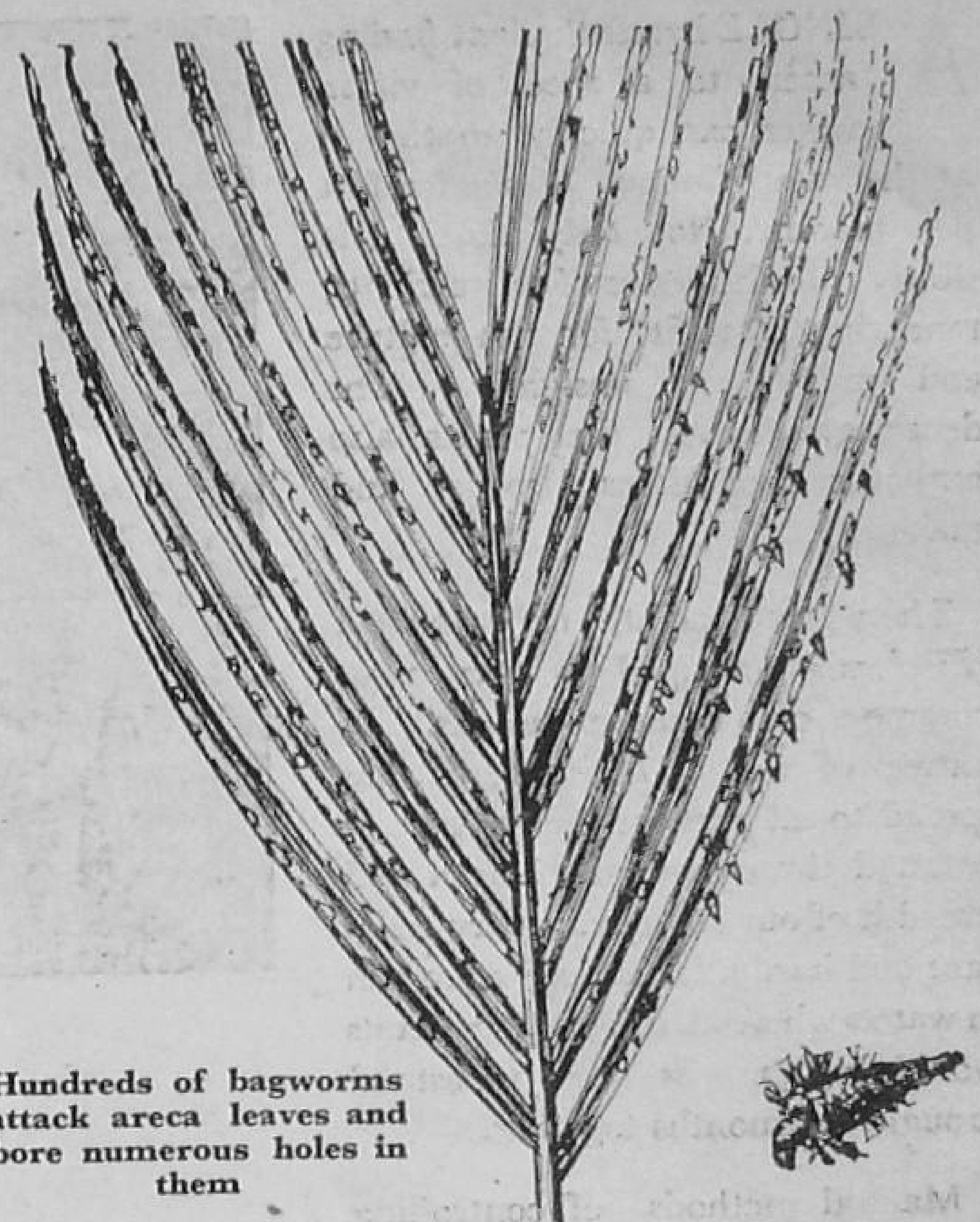
Red palm weevil and stem weevil. The red palm weevil *Rhynchophorus ferrugineus* F. and the stem weevil *Diocalandra stigmaticollis* Gyll., which usually infest coconut palms, were reported to attack areca palms as well. The grubs of the former tunnel through the soft exposed portions of the stem and crown. The latter bore through the dead tissues of stems and increase the cavities, finally resulting in the breaking of the stem.

In coconut, the red palm weevil is successfully controlled by injecting one per cent "Pyrocon-E" (Pyrethrins piperonyl butoxide), 10 cc. in 1,000 cc. of water. This can be adopted for areca palms also.

NON-INSECT PESTS

Mites. Mites do considerable damage to areca palms in several parts of India, especially during the summer months. But the pest population begins to decrease with the onset of the south-west monsoon. The mites are found in large colonies on the lower surface of the leaves. The leaves wither and dry up when the infestation is severe. Mites are also suspected to be the causal organisms of the "yellow leaf disease" of areca palm. *Raoiella indica* Hirst is the common red mite infesting areca palms. It generally attacks the tender foliage. The infested leaves turn yellow, then bronze-coloured, and finally wilt. In severe infestation, even the stem and green fruits are not spared by the pest. Other species of mites such as *Oligonychus indicus* and *Oligonychus biharensis* are also found infesting areca palms.

This pest can be checked by using some systemic insecticide, or by spraying wettable sulphur. The mites are attacked by a number of predatory coccinellid beetles, which keep the pest population under check to an appreciable extent.



Hundreds of bagworms attack areca leaves and bore numerous holes in them

MAMMALIAN PESTS

Rats and squirrels do considerable damage to tender arecanuts. The loss in yield on account of squirrels alone was estimated at about 20 per cent in Assam in certain years.

Rats can be successfully controlled by zinc phosphide or some modern rodenticide (anti-blood coagulant) like "Tomorin" or "Pivalyn". The poison is mixed with cereal powder and kept in some shallow containers in the crown or at the base of the palm. Trapping, erection of physical barriers, application of chemical repellents, etc., are some other common remedial measures.

The frugivorous (fruit-eating) bat or "flying fox" generally attacks ripe areca fruits. It is rather difficult to control this pest. Breaking their roosts by burning of sulphur in braziers under the roosting trees may give some temporary relief. Blasting of several shrapnel bombs simultaneously on the roosting tree should give better results.

Monkeys do great damage to arecanut bunches in the hilly tracts of Mysore and Bengal. The damage caused by them is so great that in some places even rewards are offered by the Government for destroying them.

Water hyacinth in bloom

Water Hyacinth Must Be Controlled

by
Dharam Vir Khanna
Fisheries Research Assistant
Batala, Gurdaspur, Punjab

A SINGLE hyacinth plant finding access to a sheet of virgin water can quickly smother it at the rate of about 75 square feet per month. Not only that. It slowly robs the water of its nutrients, rendering it unfit for fish culture and making it unsightly. The dense growth of the plants also harbours mosquitoes, leeches and snakes.

The water hyacinth, or *gul bakauli* (*Eichhornia crassipes*) is the most common of aquatic weeds. A native of South America, it has spread to all parts of the world. It is found throughout the length and breadth of our country. Very resistant and hardy, it can easily flourish in waters where all other water-plants would perish. It can withstand drought for months together.

Manual methods of controlling this weed are very costly and laborious. These can only be tried if the growth of the plants is very thin. In such cases, the plants should be taken out of water, preferably in April and May, dried on the banks and burnt. The ash can be used as a fertilizer, as it contains 28 to 30 per cent potash. A constant watch should then be kept over the pond, and any hyacinth plant seen sprouting should be removed and destroyed.

At the Government Fish Farm, Batala, trials were conducted with the hormone weed-killer dichlorophenoxyacetic acid, commonly known as 2,4-D. The chemical was used in powder form as " Fernoxone ", a sodium salt of 2,4-D and in liquid form as " Dicotox ", an ethyl ester of 2,4-D.

"Dicotox" easily and completely dissolves in kerosene oil or diesel oil ; it forms a milky emulsion with water. This weedicide was tried with both these solvents. "Fernoxone" dissolves in water, but is insoluble in kerosene and diesel oil. Hence, it was tried only with water.

HOW IT ACTS

When 2,4-D is sprayed on plants, it is absorbed by the leaf. It slowly enters the stem, and then the roots. To start with, the leaf-blades develop brown lines and streaks. Their margins turn brown and look scorched. Slowly, the entire area of the affected leaf-blade turns brown. This colour steadily goes on extending over the leaf-stalks. The portions most affected are the bases of the leaf-stalks and the bases of the leaf-blades. At this stage, the leaves fall off easily even by wind or wave action. The clumps or root-stems are the last to be destroyed. Slowly, they also become soft and rot away.

It takes some months for the entire plant to decompose and sink down. The decaying plants can easily be removed by netting ; this will save the water from pollution and make it fit for fish culture.

2,4-D arrests the growth of the old leaves immediately on application, but rather quickens the growth of new leaves and shoots, which are also attacked by the chemical in course of time. 2,4-D in very small dosages promotes growth of plants and does not kill them. The action of the chemical depends on several factors like temperature, moisture and stage of development of the plants. The spray is ineffective if it is followed by rain.

The Batala experiments were carried out in small experimental tanks, and later repeated in the field to check their accuracy. Tall and well-grown plants were used in the experiments. The observations were made during the winter months of November, 1958 to February, 1959. The weedicides were sprayed at about 10 a.m., thus allowing six to seven hours of bright sunshine to the plants. The results are given below.

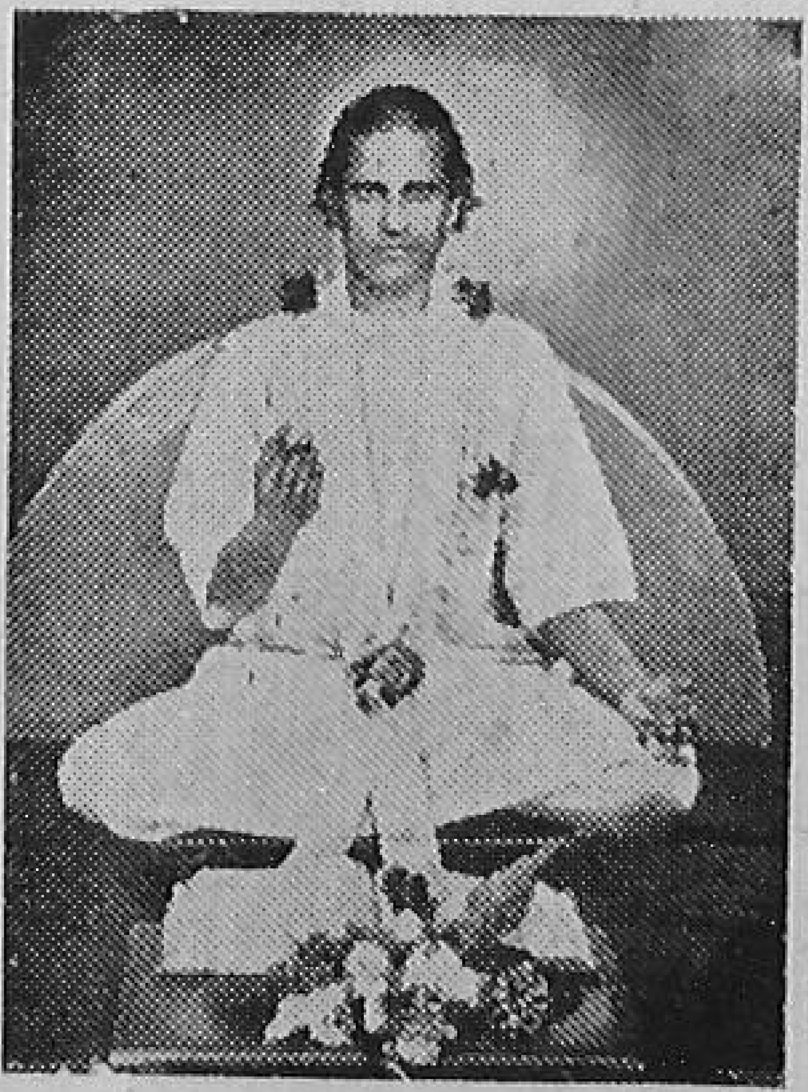
Strength of solution (parts per million)	*"Dicotox" dissolved in water*	*"Dicotox" dissolved in kerosene*	*"Fernoxone" dissolved in water*
	(Period required for destruction of plants, in days)		
100	Insufficient effect	Insufficient effect	Insufficient effect
200	do.	do.	do.
500	do.	do.	do.
1,000	do.	do.	do.
2,000	56	55	58
5,000	50	48	52
10,000	46	45	43
20,000	40	37	35
50,000	..	35	32
75,000	35	32	..
100,000	33	29	30
150,000	30	26	24

The optimum dosage of "Dicotox" in water and of "Fernoxone" in water was found to be 5,000 PPM, whereas that of "Dicotox" in oil was 3,000 PPM (when it took 50 days).

It was estimated that 2,000 pounds (200 gallons) of water or 1,500 pounds (150 gallons) of kerosene oil are required to spray an acre of water infested with water hyacinth. More complete coverage is possible with oils than with water, and there is less loss through run-off. To prepare a 5,000 PPM solution of "Dicotox" or of "Fernoxone" in water, ten pounds of the chemical may be dissolved in 200 gallons of water. To prepare a 3,000 PPM solution of "Dicotox" in kerosene oil or diesel oil, 4½ pounds of the weedicide may be dissolved in 150 gallons of the oil.

If "Fernoxone" is sprayed at the dosage recommended above in tanks where carp culture is in progress, the tank water does not become toxic to fish due to the run-off of the surplus liquid. Experiments have revealed that the lethal dosage for carps of four to eight inches length is 84 PPM with "Dicotox" and 1,200 PPM with "Fernoxone". Hence, if "Dicotox" is to be sprayed, it should be sprayed with oil, and not with water.

Umesh Yoga Darshan (FIRST PART)



In Four Languages: English, Hindi, Gujarati & Marathi
Author: Shri Yogiraj Umeshchandraji

An excellent treatise on the true meanings of Yoga, which explains to you how to control your digestive, nervous, respiratory, urinary and other body systems. The book is fully illustrated with 108 real Asana Photographs and explains to you about their efficacy in attaining complete remedy of various ailments or disorders through the medium of Yoga, Naturopathy, Chromopathy, Psycho-Therapy etc.

Shri Yogiraj Umeshchandraji

Useful for men and women alike, young or old, healthy or unhealthy. Deserves a rightful place in every home, hospital and library. Price: Rs. 15|- plus Postage Rs. 2|- extra. No V.P.P. sent.

RAMTIRTH BRAHMI OIL Registered. Special No. 1.

An invaluable hair tonic for the prevention of dandruff and falling hair. Manufactured scientifically with many precious ingredients, which cools brain, improves system, and brings sound sleep. Most ideal for body massage. It is useful to everyone in all seasons. Price: Rs. 4|- for big bottle and Rs. 2|- for small. Available everywhere.

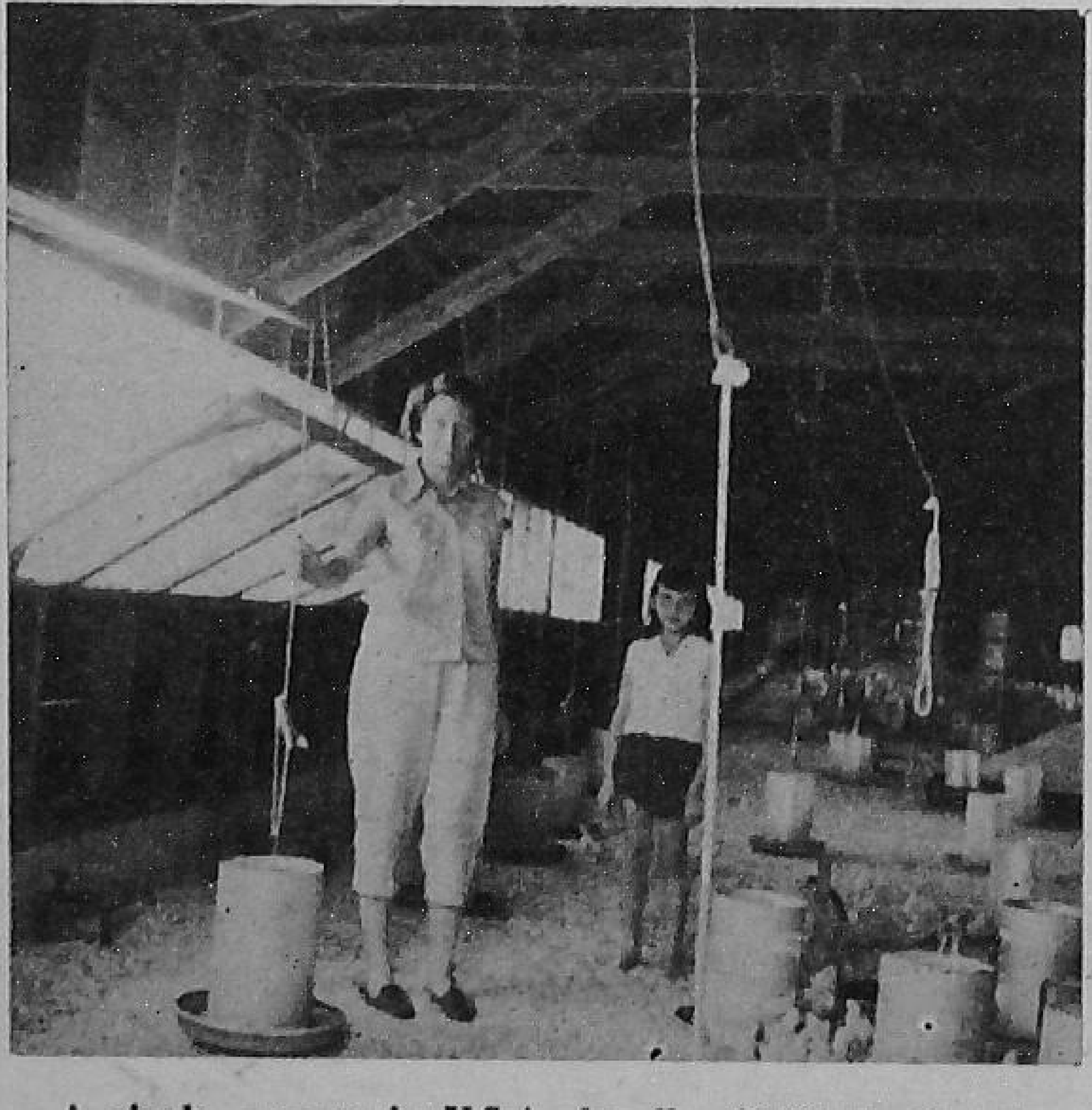
SHRI RAMTIRTH YOGASHRAM
Dadar, Central Rly., Bombay-14. Phone: 62899

BROILERS DO HAVE A FUTURE IN INDIA

Week-old broilers in a shed in U.S.A.

by
N.S. Garewal
Poultry Development Officer
Government Model Poultry Farm
Delhi Cantonment

OF about 50 per cent male chicks got in hatchings, a large number is surplus for breeding purposes. The best way of utilizing this stock would be to raise them as broilers for the table, for which there is already a good demand in India.



A single person in U.S.A. handles 18,000 broilers in a 300 feet long shed. Hanging mash hoppers like the ones seen here have been found very economical.

Typical broiler-raising is not very common in India at present. But there is certainly a great scope for it. Broiler production needs rapid growing stock, specialized housing and slightly different feeds from that of egg-producing stock.

Although breeding is not done at present from the broiler production point of view, we can profitably use some of our meat type strains of New Hampshire, White Cornish, White Rock, Rhode Island Red and Light Sussex. Interbreeding of these breeds may also provide types quite suitable for broiler production.

It is advantageous to rear broilers in sheds all the time. This results in better feed utilization, much saving in labour, less feed requirements and prevention of diseases. These chicks require hardly two square feet running space each up to the age of nine to 12 weeks, when they attain the required weight of two to three pounds.

The sheds should have nearly three feet high brick walls, G.C. sheets, asbestos sheets or wooden sheets. Above these, there should be nearly six-foot high wire-netting. The roof should be sloping and made of similar material. Broiler sheds can be very easily made with bamboo jaffery reinforced by wire-netting and mats

or gunny bags. It is most important to keep nine inches deep litter in such sheds to provide dry and hygienic surroundings. Sawdust or wood shavings are best. This litter needs raking up every other day.

DIFFERENT FEEDS

Feeds for broiler-raising are slightly different from breeder and layer feeds. Animal fats or vegetable oils give much better feed conversion for broilers than for laying stock. Vegetable oils are more suitable due to their consistency, but they are costlier compared with animal fats. They have a special value in broiler production and can be used up to five per cent of the total ration. Some of the fats like tallow and other edible and inedible greases could also be used. It is essential to use some anti-oxidants with such fats so as to check the spoilage of the feed due to oxidation. Taking into account the cost, availability and the utility, the following feed formula is recommended.

	Per cent
Ground yellow maize	60
Groundnut cake	25
Corn glutenmeal	3
Meatmeal	5
Dried lucerne	2
Ground limestone or river shells	1
Stabilized fat	3
Salt	½
Mineral mixture	½

Nothing is required over and above this ration except a constant water supply. It is always better to use dry mash all the time. Hanging mash hoppers are more economical.

On the basis of trials conducted on day-old sexed male chicks at the Delhi State Model Poultry Farm, it can safely be stated that the broiler chick feed as per formula given above can give 2.5 to three-pound weight at 12 weeks' age. Against a cost of production of Rs. 2.25 per chick, a sum of Rs. 2.50 can be realized, leaving a net profit of 25 nP per chick. One person can handle about 12,000 broilers in two sheds 30 feet wide and 400 feet long without much extra help. Four broods of broilers can be raised in a year quite easily. Now work out the profit yourself!

* * *

PENGUIN EGGS

Penguin eggs, now used in exotic dishes in many countries, have provided a delicacy in the Union of South Africa for years.

The South African Department of Commerce and Industries supervises the sale of the eggs which are collected from the large colonies of penguins inhabiting the Guano Islands off the west coast of the Union and Southwest Africa.

The Department protects the penguins and gathers the eggs annually. In a good season, approximately 4,000 cases, each containing two dozen eggs, are obtained.

BAYER

DIPTEREX

(80% Soluble Powder)

- ★ Good Penetrating Action
- ★ Wide Range Effectiveness.
- ★ Non-Tainting.
- ★ No Residue Problem.
- ★ Low mammalian Toxicity

A new organophosphorous insecticide from the laboratories of

Farbenfabriken Bayer A.G.,
LEVERKUSEN

★

SHORTLY AVAILABLE

PROCESSED IN INDIA BY:

Bayer-Agrochem (Pvt.) Limited,
BOMBAY

* * *

TECHNICAL DETAILS FROM

Sole Distributors:

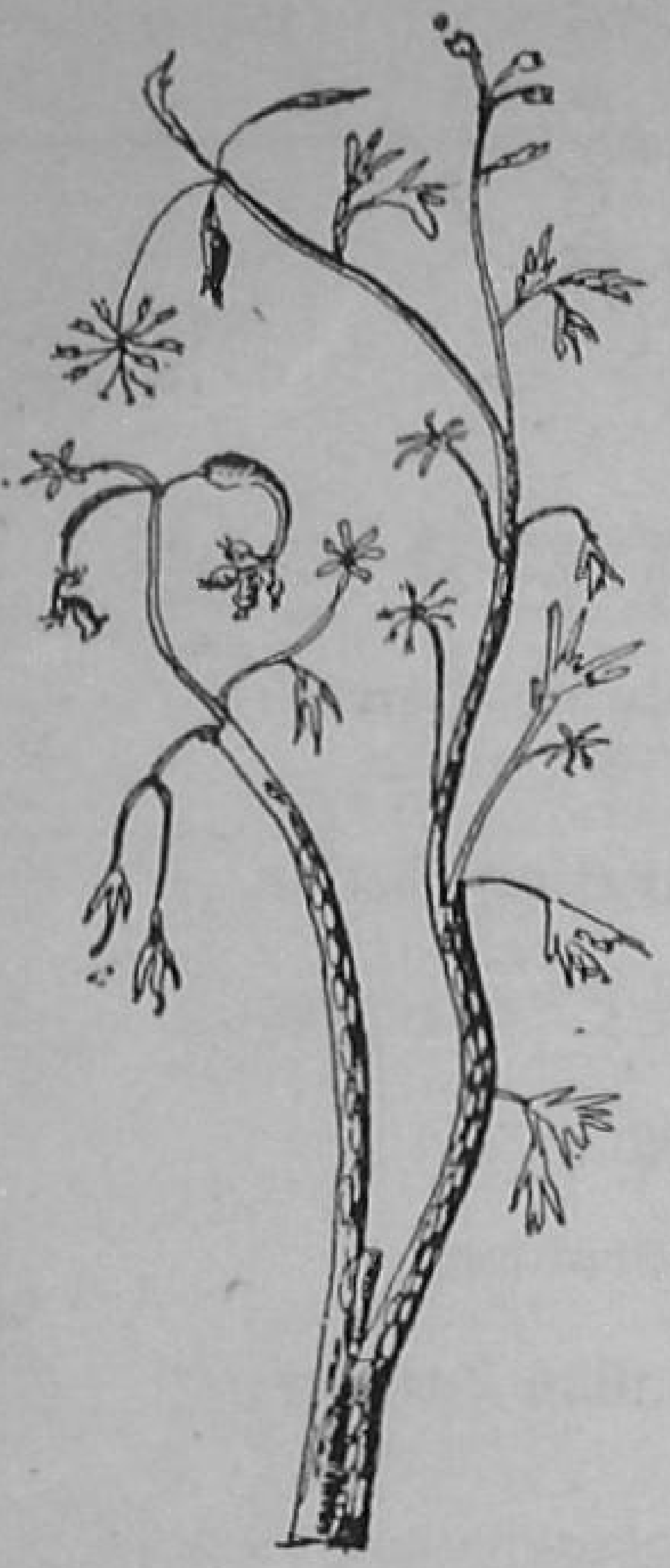
CHIKA Private LTD.

Bombay, Calcutta, Delhi, Madras

BAYER

CORIANDER AND ITS 3 DISEASES

by
B.G. Nikam
S.N. Kulkarni
F.K. Pawar
Agricultural Research Institute
Gwalior



Swelling on coriander plant caused by the fungus *Protomyces macrosporus*

CORIANDER (*Coriandrum sativum* L.) is one of the important cash crops of Madhya Pradesh. It is grown over an area of 1,20,700 acres in almost all the districts of the State for seed. It is locally consumed as well as exported in large quantities for commercial and industrial purposes. This crop is subject to three important diseases, viz., wilt, powdery mildew and tumour, causing a loss of five to six lakhs of rupees every year.

Wilt is caused by a soil-borne fungus (*Fusarium oxysporum* f. *coriandrii*), and is a very serious disease in the districts of Guna and Sagar. The disease is so prevalent that scarcely a field of coriander is found free of the infection. Forty to 50 per cent losses are common, and 60 to 75 per cent uncommon, while in extreme cases 100 per cent losses have been recorded. In fact, the disease has become a limiting factor in the cultivation of coriander in the district of Guna.

In 1950 and 1953, the disease was reported in Mysore and Rajasthan, respectively. It was reported as early as 1936 from the then Gwalior State. The Mycological Section of the Agricultural Research Institute, Gwalior, made a survey and found out the organism responsible for wilt.

The first noticeable symptom of the wilt disease in the field is the drooping of the plant. This is followed by the withering and drying of the leaves, resulting ultimately in the death of the plant. Discolouration of the vascular system, a characteristic of *Fusarium* wilt, is found only in the root system.

Coriander plants on left are healthy ones, while those on right are diseased

Wilted plants can easily be pulled out of the ground. Partial wilting is also a feature in which the growth of the plant is arrested, the leaves become pinkish-yellow to quite yellow in colour. Sterility of the affected plant is very common. If seeds are formed before a plant is infected, they do not mature.

The infection takes place in the seedling as well as in the adult stage of the plant. The intensity of the disease depends upon the spore-load, temperature and moisture in the soil.

Work done at Gwalior indicates that use of resistant types is the best method of control. A few selections (strains *65* and *83*) from the local variety of coriander, tested in wilt-sick soil at Gwalior, appear promising. It has also been observed that seed-treatment with fungicides like "Agrosan GN" can also minimize the disease.

POWDERY MILDEW

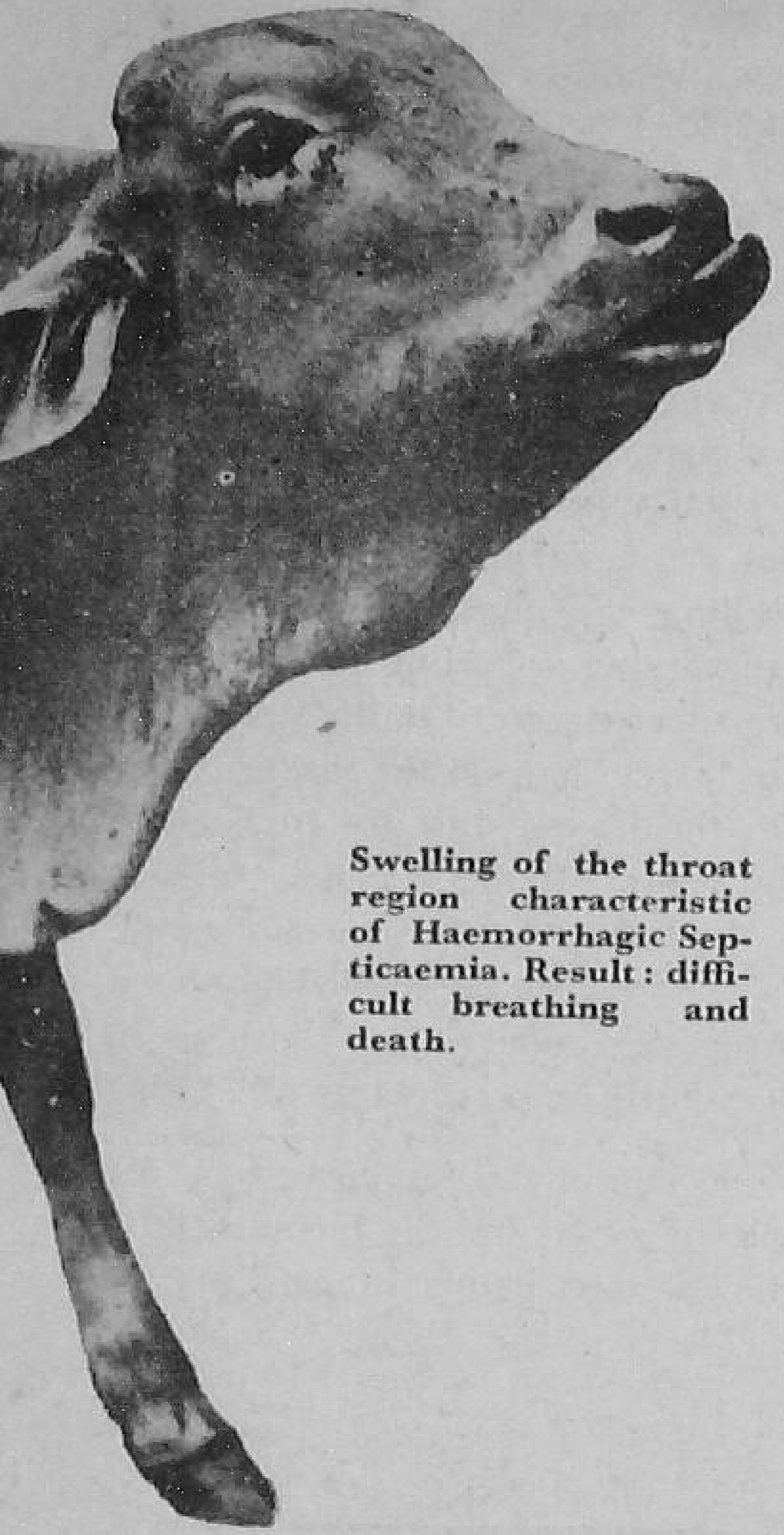
Powdery mildew is caused by the fungus *Erysiphe polygoni*. The disease appears in the months of February and March when the day temperature begins to rise. The disease manifests itself by the appearance of white powder (spore mass and mycelium) on all aerial parts of the plant. Affected leaves lose their chlorophyll and dry up. Setting of fruits does not take place. Fruits, if formed, remain undeveloped and immature. In the early-sown crop, viz., the crop sown in the early part of October, the disease usually does not appear. But in the late-sown crop, viz., that sown in the month of December, the disease assumes a severe form, causing an average yield-loss of 20 to 40 per cent.

Dust the crop with fine sulphur powder (300 mesh) when the crop is two months old, and again after the setting of the fruits, at the rate of ten to 12 pounds per acre.

TUMOURS

Tumours is caused by the fungus *Protomyces macrosporus*. The disease appears in the form of tumour-like swellings, most commonly in the flower stalks, leaves, petioles (leaf stalks) and green parts of the stem. The swellings are mostly elongated, the size varying according to the size of the affected part. On the stem, they are larger than on the flower stalks. On the leaves, they are confined to the veins. If the infection spreads to the fruits, they become elongated. In severe cases, the whole plant has a deformed appearance, resulting in very little or no yield at all.

No prophylactic measures are known so far, but the burning of all the infected plants can reduce the incidence of the disease.



Swelling of the throat region characteristic of Haemorrhagic Septicaemia. Result: difficult breathing and death.

PREVENTING INFECTIOUS DISEASES OF LIVESTOCK

by
S.S. Khera
Indian Veterinary Research Institute
Izatnagar, U.P.

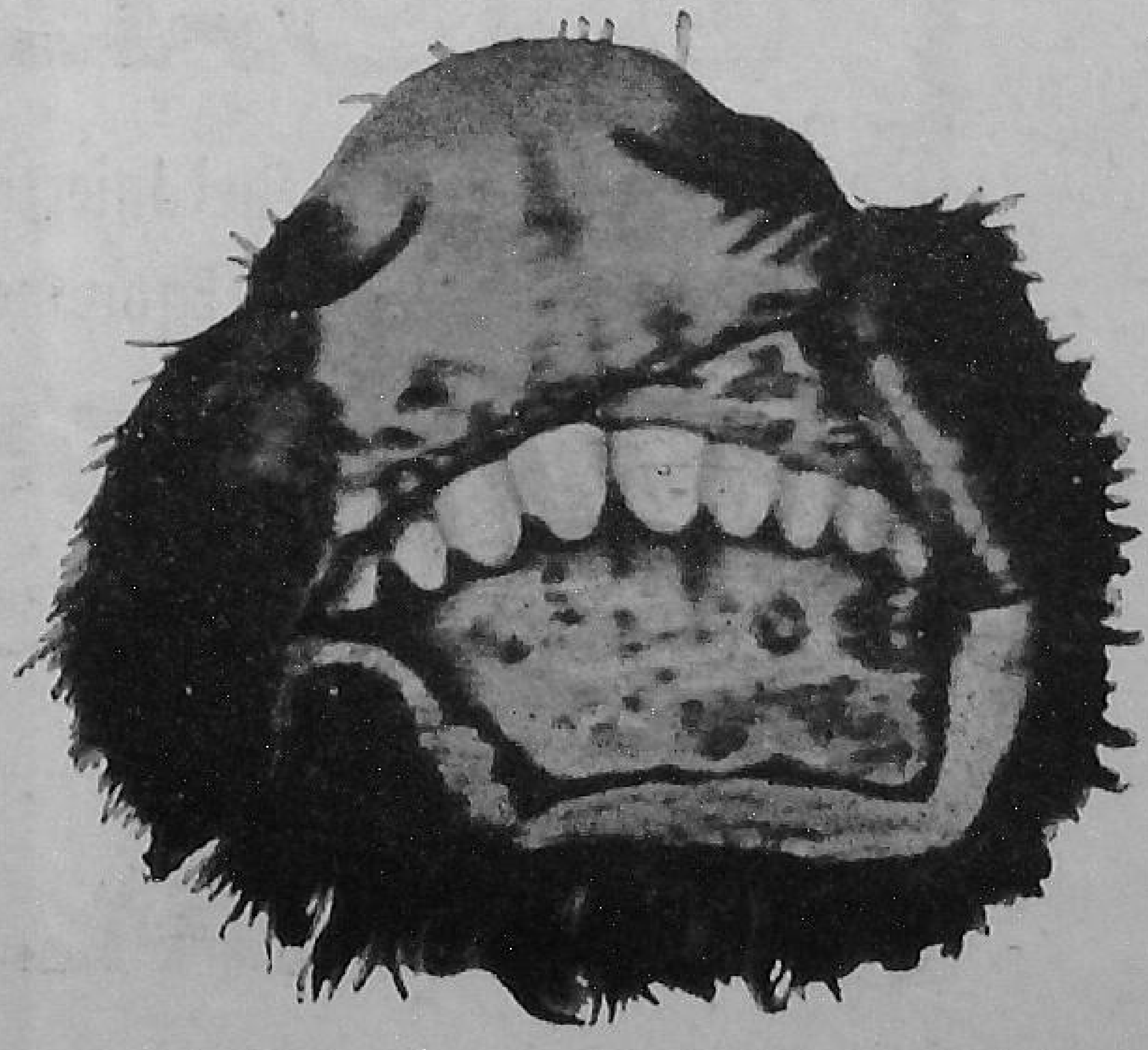
ABOUT 20 lakh animals are affected by infectious diseases in our country, of which about two lakhs die. The annual loss from deaths and reduced productivity is estimated at Rs. 30 crores, not to mention the cost of treatment.

Much useful research has been carried out on most of the important infectious diseases by veterinary research laboratories in this country as well abroad, and it is now possible to eradicate many of these diseases.

The micro-organisms causing the different diseases differ in habitat, distribution and other characters. Consequently, these diseases also differ appreciably in their mode of spread, distribution and amenability to control. For example, the rinderpest disease of cattle, which until recently was responsible for more than 60 per cent of the total mortality from infectious diseases among cattle and buffaloes in this country, can now be controlled by a vaccine, a single inoculation of which confers almost life-long protection. A similar potent vaccine conferring life-long protection has also been evolved against the Ranikhet disease of poultry. Although researches have not yielded similarly potent protective agents for other diseases, it is nonetheless possible with the help of specific vaccines to reduce considerably the losses from these diseases.

The more important livestock diseases are briefly described in this article.

Ulceration of lips and gums in rinderpest



RINDERPEST

Otherwise known as cattle plague, *moak, maata*, this disease is enzootic in this country, and rinderpest outbreaks occur throughout the year. It affects mainly cattle and buffaloes, but sheep and goats may also contract the infection. The death rate varies with the different breeds, being very high in imported and cross-breeds and hill cattle (70 to 90 per cent mortality) and low in the native breeds of the plains (20 to 50 per cent mortality). In the acute form, the disease is characterized by a rise of body temperature, glairy discharge from the eyes and the nose, ulceration of lips, the pads and inner surface of cheeks, increased secretion of saliva, which flows from the mouth, followed by severe fetid diarrhoea, weakness and usually death in five to ten days. The course of the disease may, however, extend to two to three weeks, when the animals become rapidly emaciated and die of exhaustion. In milder cases, the symptoms are only of moderate intensity and subside in four to six days.

Treatment is of little use. The only effective measure is preventive vaccination. A single inoculation confers almost life-long protection. The inoculation does not in any way affect the health of the animal, nor is there reduction of milk yield in lactating animals.

Under the Rinderpest Eradication Scheme of the Government of India, a campaign for large-scale vaccination of cattle and buffaloes is going on all over the country.

HAEMORRHAGIC SEPTICAEMIA

Haemorrhagic septicaemia (*galghotu, ghari*) takes a toll of nearly 60,000 head of cattle and buffaloes every year. The incidence is closely related to the onset of rains, both in summer and winter, but small outbreaks involving a few cases continue to occur throughout the year. The period of maximum occurrence is the rainy months of summer, i.e., July to September, during which more than 60 per cent of the deaths occur.

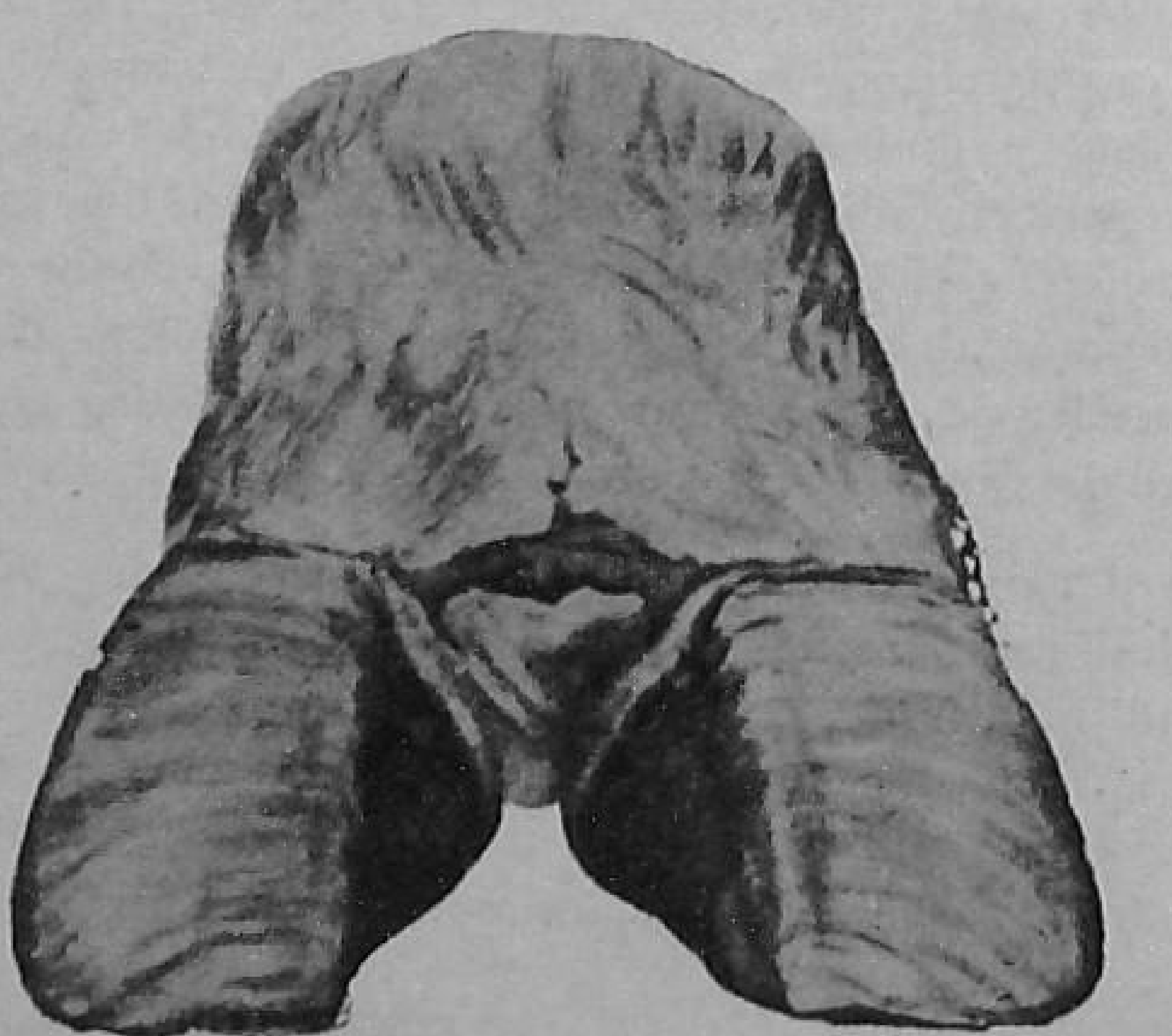
This disease takes a variable course. In the commonly-occurring form, it is characterized by high body temperature and swelling in the throat region, which may in due course extend to the underside of the mouth, including the tongue, and head and to the neck, dewlap and shoulders. Breathing is difficult and laboured. Death takes place from a few hours to two days after the onset of symptoms.

In the other form, the disease manifests itself as an acute pneumonia characterized by high temperature, cough and difficult breathing, followed by death in one to four days. Occasionally, in acute cases, the animal may die quickly or within a few hours after the first sign of rise in body temperature without any of the symptoms mentioned above.

Treatment, besides being costly, is of some use only in the early stage. Most of the cases are fatal.

Complete eradication of this disease is rather difficult, as the micro-organism causing it is present in the respiratory tracts of some proportion of healthy

The work of foot-and-mouth: ulceration between digits . . .



. . . and on the tongue

animals, resulting in the perpetuation of the disease.

To safeguard against outbreaks of the disease in rainy months, it is highly advisable to get animals vaccinated before the onset of rains. A new vaccine which has been recently evolved, confers, on single inoculation, protection for at least one year. Therefore, a vaccination programme against this disease should be carried out every year.

BLACK QUARTER

Black quarter affects chiefly young cattle and sheep, and is responsible for nearly 40,000 deaths every year. More than 80 per cent of the cases occur in Madras, Andhra, Mysore and Bombay. In other states, and particularly in north-western India, it is rather uncommon. The occurrence is higher in the warmer months, i.e., from May to September and in areas with high relative humidity. The infection is contracted from pasture infected with the excreta of affected animals.

The disease is characterized by high fever and a hot, painful swelling in muscular regions of the body such as the shoulder, back, loins or neck. Due to the formation of gas in the muscular tissue, palpation of the swelling gives a characteristic crackling sound. Death generally takes place within one or two days.

Treatment, when undertaken early, is successful in some proportions of the cases.

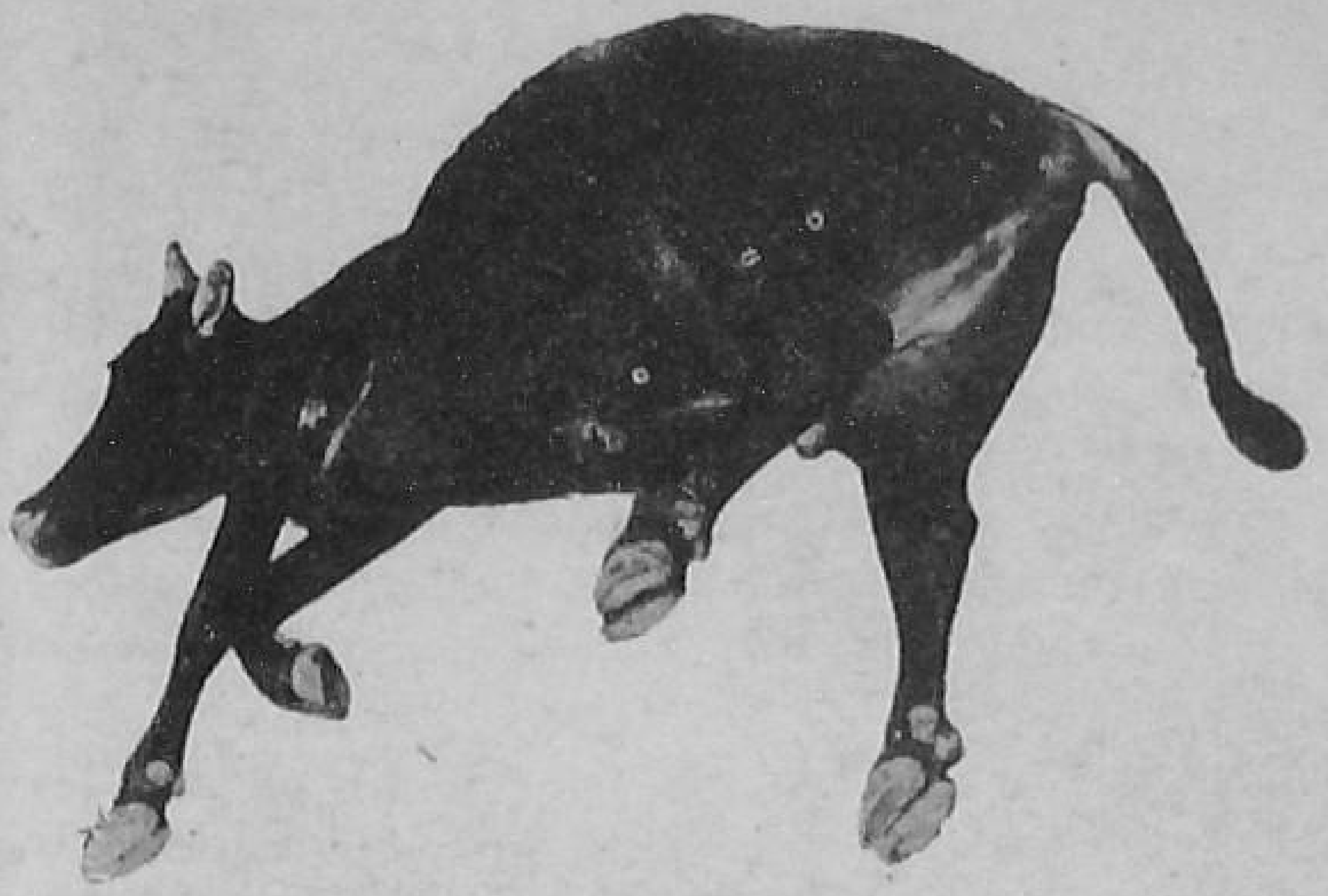
The vaccine for this disease confers protection for about a year and, therefore, inoculations should be repeated every year in areas of high incidence. It is advisable to get the animals vaccinated some time in the early spring.

ANTHRAX

Anthrax (*goli*) occurs mainly in cattle and sheep, and less commonly in goats, buffaloes and horses. It is also communicable to man. In cattle and sheep, nearly 8,000 deaths occur from this disease every year. Generally, only sporadic cases occur. This infection is contracted by consuming food contaminated with the bacterial spores (infective stages). These spores are able to survive in the soil for years.

In cattle and sheep, the disease generally occurs in a very acute form and the animals may be found dead without any noticeable illness; when death does not occur so suddenly, the animal may show high fever and abdominal pain, followed by blood-stained stools and death within a few hours. The death rate is nearly 100 per cent.

As the disease is not so widespread, protective vaccination is undertaken only after confirming the



Carcass of a young male calf dead of black quarter: the left hind-quarter shows the crepitating swelling

existence of the disease in the area. In areas where it recurs every year, it is advisable to get the animals vaccinated every year. The vaccine confers protection for about one year.

FOOT-AND-MOUTH

Foot-and-mouth is a disease of cloven-footed animals, i.e., cattle, buffaloes, pigs, sheep and goats, but its main victims in this country are cattle and buffaloes. Although the native breeds of cattle in this country have developed some measure of resistance, the overall mortality from the disease being rather low (about 5,000 deaths per year), the disease is of considerable economic importance owing to the great disability caused to the crores of animals which survive the attack.

This is a highly contagious disease and, in addition to the spread from animal to animal, which is most common due to the herding together of animals from different villages in common pastures, the infection may also be spread through the agency of contaminated fodder, water, attendants and even birds. The disease is characterized by dulness and rise in temperature—which symptoms generally pass away unnoticed, followed by the formation of vesicles on the tongue, lips, clefts of the feet, and, less frequently, on the udder. The animals are run down in condition due to the reduced food intake; the milk yield of lactating animals and the working capacity of draught animals are affected.

There is no curative treatment for the disease. The symptoms may be alleviated by dressing the foot and mouth lesions with proper antiseptics such as potassium permanganate and alum solutions. The vaccines so far evolved are too costly to allow of large-scale protective inoculations. Researches are in

CONTINUED ON PAGE 25

Bihar Gets A Better Jute

by
M. D. Nandkeolyar *and* **S. A. Dadlani**
Botanical Substation
Pusa, Bihar

A NEW variety of jute, *E.C. 4142*, tested at the Pusa Botanical Substation of the Indian Agricultural Research Institute has consistently outyielded the improved varieties *D-154*, *JRC-212*, *JRC-321* and *Fanduk* evolved by the Jute Agricultural Research Station, Barrackpore.

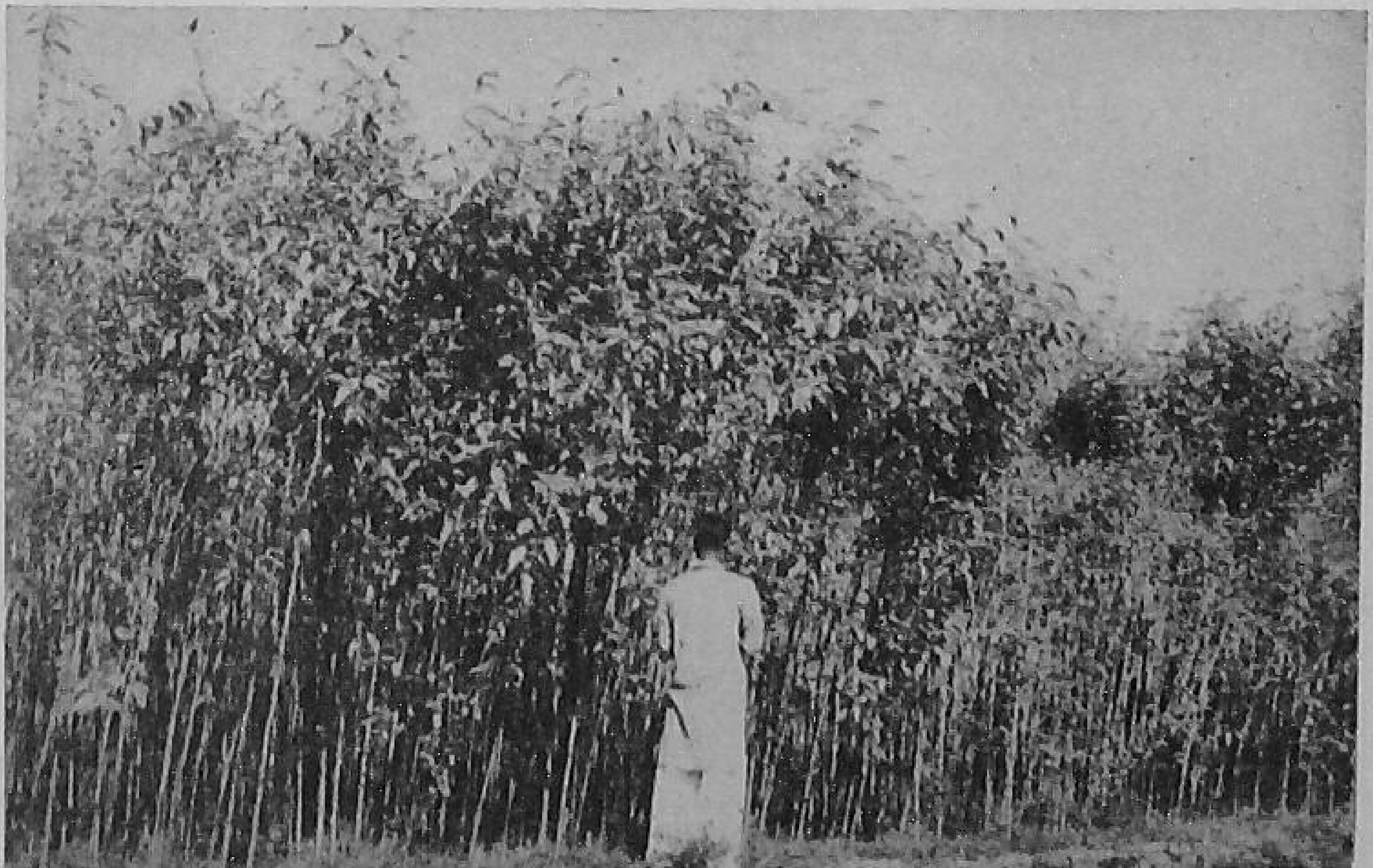
The exact origin of this variety has not been determined satisfactorily. The Plant Introduction Section of the Division of Botany of the Indian Agricultural Research Institute, New Delhi, obtained a number of samples of jute varieties from foreign countries. This collection included a variety, a few plants of which appeared amongst the exotic cultures of leguminous seeds. This material was accessioned as *E.C. 4142*, and has been grown and tested since 1952 at the Pusa Substation. The results of the Substation trials, which were conducted from 1953 to 1958, are given in the table at the end of the article.

It is seen that *E.C. 4142* has given the best fibre yield in all the five years of the trial.

Another important feature of this variety is that it is non-branching, a quality preferred in fibre crops. It shows the tallest plant growth. It takes about 15 days more to mature than most Indian types. However, it is a poor seed-setter, but this should not materially affect its value as a yielder of more fibre.

E.C. 4142 yields excellent fibre of a golden yellow colour, which makes very strong ropes. The fibre was sent to the Jute Technological Laboratory, Calcutta, for quality testing. The results of the test are given below, along with the data for other varieties.

Variety	*Ballistic work of rupture (in lb.)*	*Quality ratio*
E.C. 4142	44	100
D. 154	36	86
JRC-212	42	96
JRC-321	46	103
Fanduk	43	98



Crops of *E. C. 4142* (*left*) and *D. 154* (*right*) as they looked when 60 days old

It is seen that *E.C. 4142* yields a fibre which is much superior to that of *D. 154*, *JRC-212* and *Fanduk*. *JRC-321* is somewhat, but perhaps not significantly, superior in fibre quality, but in fibre yield it is far inferior to *E.C. 4142*.

CULTIVATION

The soil where the experiments were conducted is of a light type—loam to sandy loam. The field was prepared and manured with ten cartloads of farmyard manure.

The seed was sown in the first fortnight of May in a previously irrigated and finely prepared seed-bed. In three of the five years, it was not even necessary to irrigate the land in the first week of May, due to early showers. The seed was sown in rows a foot apart at five pounds per acre, and after germination, the seedlings were thinned out to a spacing of four inches within the row. Seedlings up to one foot high could stand transplanting very well, and patches showing poor germination were transplanted with the seedlings thinned out from elsewhere. When the seedlings were one foot to 1½ feet high, a light topdressing with 100 pounds ammonium sulphate per acre was given. The crop needed periodical weeding and interculturing with a hand-hoe. In all, two to three hoeings and weedings could be given before the crop reached a height when it was no more possible to do the intercultivation.

The different varieties started flowering from the middle of August onwards; *E.C. 4142* flowered the last, i.e., in the beginning of September. It took about a fortnight more to flower as compared to the variety *D-154*. By the middle of September, the crop had reached the small-pod stage, when it was harvested and kept for retting in a nearby pond. The crop grown for seed, however, continued till the beginning of November, when it was harvested and threshed.

The crop did not need any irrigation except one given for the preparation of land. The regular monsoon generally commences at Pusa by the middle of June, and about 40 to 45 inches of well-spaced rainfall is received between June and September.

PROFITABLE CROP

In spite of its somewhat late maturity, *E.C. 4142* can be profitably grown even in lighter soils without any extra care as a cash crop in the *kharif* season. If grown as a *kharif* crop, it matures sufficiently early to make the land available for cultivation for the sowing of *rabi* crops like wheat, barley, oats and gram.

Seed of *E.C. 4142* can be obtained from the Botanical Substation, Pusa, Bihar.

URGENT NEED

Jute grows very well in the moist climate of Assam, Bengal and Bihar; it is also grown in a small way in other parts of the country, e.g., Madras, Kerala, Uttar Pradesh and Bombay. The major areas of jute cultivation are the states of Bengal and Bihar. The total acreage of jute in India has gradually increased from about 65,000 acres in 1947-48 (immediately after partition) to nearly 1.6 million acres in 1956-57. The area under this crop in Bihar in 1956-57 was about 6,65,000 acres, which is about 40 per cent of the all-India total. Of this, only about 85,000 acres are reported to be under improved varieties. This clearly indicates the urgent need and scope for making available to the farmer seed of the best improved varieties.

Variety	1953—54			1954—55			1955—56			1956—57			1957—58		
	Yield/acre in lb.			*Yield/acre in lb.*			*Yield/acre in lb.*			*Yield/acre in lb.*			*Yield/acre in lb.*		
	Seed	*Fibre*	*Av. height of plant in feet*	*Seed*	*Fibre*	*Av. height of plant in feet*	*Seed*	*Fibre*	*Av. height of plant in feet*	*Seed*	*Fibre*	*Av. height of plant in feet*	*Seed*	*Fibre*	*Av. height of plant in feet*
E.C. 4142	567	1,887	10.85	1,343	5,235	12.40	350	1,201	11.22	567	3,090	9.81	165	911	10.36
D.154	1,230	1,320	10.27	2,762	3,707	10.56	530	642	10.89	775	2,069	9.28	706	667	9.87
JRC-242	..	..	..	..	..	..	404	915	11.22	1,030	2,713	9.51	644	808	10.32
JRC-321	..	..	..	..	..	..	472	735	10.84	718	2,328	9.80	730	641	9.88
Fanduk	..	..	..	..	..	..	486	724	10.61	832	2,496	9.51	684	401	9.96

In Mysore,

They Grow "Baje" For Cash

by
G. V. B. Naidu
Research Officer
Agricultural Research Station
Kyathasandra

IN practically all homes in the South, they keep *baje*. Otherwise known as *bache* or sweet flag (*Acorus calamus*), it is considered a stock remedy for children's ailments.

The uses of *baje* are described in detail by Watt: " In England it is used in the manufacture of liquors and snuff and an essential oil prepared from its leaves is used in the preparation of a hair powder. As an insecticide it was used for treatment of the foot-and-mouth disease of cattle and a preparation with garlic, cummin seed, salt, sugar and butter called ' Arata ' for strengthening horses."

At present, the rhizome is commonly used as a good emetic for fever, indigestion and flamlance in infants ; one end of it is burnt, powdered and a little of it administered. It is also noted for treatment of intestinal worms, to cure bites of poisonous reptiles, to clear throat infections and foul breath, and to preserve clothes from moth attack.

The *baje* commonly used is the rhizome or root of the plant. It is generally found growing wild in and around marshy places as a semi-aquatic plant, and is usually collected during the summer months. In some parts of the South, it is a minor forest product. The rhizomes yield 1.3 to 2.6 per cent of a yellow neutral oil.

In Mysore State, the cultivation of *baje* as a cash crop has long been confined to the Koratagere

Baje **ready to go to the market**

Seed material is preserved either in separate seed-beds or just at the side of a ditch, as seen here

taluk of Tumkur district. Only in recent years has its cultivation spread to the neighbouring taluks to a limited extent. In all, about 30,000 to 45,000 maunds (local) of rhizomes are marketed yearly.

CULTIVATION

Baje cultivation is confined to clayey loams and other heavy soils, and requires plenty of water. Just like paddy, during the entire growing season of about ten months, the crop should be completely irrigated and the land never allowed to dry. A soft and wet field helps the rhizomes develop well.

The field is ploughed three to four times, puddled and levelled up. About eight to ten cartloads of leaves and young twigs of *honge* (*Pongamia glabra*), abundantly available in the area, are then evenly spread, trampled in and left for a few days to decompose. Before planting, 20 to 25 cartloads of farmyard manure are applied ; sometimes, eight maunds of superphosphate per acre are also applied along with the cattle manure. Planting is generally done in May-July, though it can be done in all seasons—the main consideration being the availability of hot sun for drying the rhizomes.

The seed material used is the young growing tips of the previous crop, carefully preserved either in separate seed-beds or, as is common, just at the side of an irrigation channel or ditch. These tips are planted in rows one foot to 1½ feet apart, depending on the nature of the soil and preparation, by pressing about an inch or two of the root portion into the ground, leaving the top leaves well above the ground. Generally, the plants in the rows alternate with each other, so that the rows are formed only one way. The field is well irrigated and a constant water level is maintained till harvest.

During the growing season, weeding is done about once a month ; during each weeding the growing portion of the rhizome is pressed down into the soil whenever it is found growing erect. If necessary, some more farmyard manure is applied in the fourth month. At about ten months from planting, the leaves show signs of yellowing and start drying up from the tip downwards, indicating that the crop is ready for harvest.

Harvesting is the most difficult and costliest operation, involving the digging up of the rhizomes which will have rooted profusely at each node. About 100 to 150 labourers per acre are required to dig up the clayey soil. The rhizomes vary from 12 to 30 inches in length, depending on the fertility of the soil, and are divided by a series of nodes. They are covered with leafy scales, and at each node prolific roots three to five inches in length are found. These rhizomes are dried by spreading out on rocky ground after the roots are cut and removed.

About four to five days of bright sun is sufficient for drying. The rhizomes are then beaten with sticks and

A good stand of *baje*

This *baje* crop has been newly planted

rubbed with gunnies to remove the thin leafy scales and to break them into small bits. The broken lengths are again dried for about five to six days, cut up into pieces of two to four inches length and marketed.

The crop is free from pests and diseases, apart from stray attacks of leaf spot which, however, does not seem to affect the growth or yield in any way.

A good crop gives about 200 maunds (local) of rhizomes from an acre in the area, which brings in about Rs. 1,800. This leaves a net profit of Rs. 800 to 900 per acre to the cultivator.

* * *

I : S : I STANDARDS

SPECIFICATION FOR ENDRIN TECHNICAL

The Indian Standards Institution has published a specification for Endrin (IS:1309-1958).

Endrin, technical, and its formulations are largely used in the control of insect pests of agricultural importance. This standard prescribes the requirements and the methods of tests for endrin, technical, employed in the preparation of insecticidal formulations.

The standard has been prepared to facilitate the supply of endrin, technical, of a quality most suitable for use under subtropical and tropical conditions.

This standard is one of a series of Indian Standards on pesticides and their formulations. The standards in this series cover BHC, DDT, dieldrin, aldrin, endrin and their formulations; lime sulphur solution; pyrethrum extracts; nicotine sulphate solution; zinc phosphide, fumigants like ethylene dichloride carbon tetrachloride mixture, ethylene dibromide and methyl bromide, etc.

Copies of the Standard, published in English and priced at Rs. 2.00 each, are available from the office of the Indian Standards Institution 'Manak Bhavan', 9 Mathura Road, New Delhi, and from its branch offices at Bombay, Calcutta and Madras.

MILK BOTTLE CRATES

The Indian Standards Institution has already formulated an Indian Standard for Glass Milk Bottles [Doc: AFDC 12(19)]. There was a need for a specification which prescribed the dimensions and other requirements for crates for holding and transporting glass milk bottles produced in accordance with the above specifications. The Institution has met this need by drafting an Indian Standard for Milk Bottles Crates [Doc: AFDC 12(21)].

Copies of the draft standard, which are being put into circulation for eliciting comments of the users and manufacturers are available from the office of the Indian Standards Institution 'Manak Bhavan', 9 Mathura Road, New Delhi, and from its branch offices at Bombay, Calcutta and Madras. The last date for the receipt of comments is *November 21 1959*.

INDIAN STANDARDS FOR SUGAR INDUSTRY

The Indian Standards Institution has published the following two Indian Standards for use in Sugar Industry in India.

1. *Methods of Test for Vacuum Pan Sugar* (Plantation White) (IS:499-1958) which prescribes the methods of determination of moisture, pol, sucrose, reducing sugars, hydrogen ion concentration, sulphated ash and certain deleterious impurities, namely sulphur, lead copper, arsenic, iron and zinc in vaccum pan sugar (plantation white). The standard is intended for the introduction of uniform methods of analysis of vaccum pan sugar (plantation white) in India.

2. *Specification for Cane Molasses* (IS:1162-1958) which prescribes the requirements and the methods of test for cane molasses obtained in the manufacture of direct-consumption white sugar by the vaccum pan process and meant primarily for use in the alcohol industry.

Copies of the standards, published in English and priced at Rs. 4.00 and 2.00 each, respectively, are available from the office of the Indian Standards Institution 'Manak Bhavan', 9 Mathura Road, New Delhi, and from its branch offices at Bombay, Calcutta and Madras.

Why Not Try Buffel For Fodder?

by
J. S. Saxena
Cattle Breeding-*cum*-Dairy Farm
Kalsi, Dehradun

Buffel in the field

PASTURE is the most economical means of rearing livestock. But most pasture species are annuals and there is a transitional phase after both the *kharif* and *rabi* seasons when there is an acute shortage of green forage, and the livestock lose in condition. Perennial species introduced in the crop rotation would ensure a supply of green fodder, particularly during the summer months.

One such species is *Cenchrus ciliaris.* It was introduced into Australia about 1870 ; it became well established, and the Department of Agriculture in West Australia actively encouraged its spread in the low rainfall regions of the State. As many as 80 different strains of this grass have been introduced by the C.S.I.R.O. Buffel grass is also found in Africa, the African strain being more leafy than the Indian type.

A small quantity of buffel grass seed type " D " from Australia was introduced at the Central Sheep and Wool Research Station, Pashulok, Dehradun, in 1955. It has become well established there, and over five acres have been put under it.

Buffel thrives best on good loam soils, and is excellent for pasture if the plot is periodically harrowed and manured. Buffel is a more vigorous and productive grass than *anjan*, and provides more leafy foliage. It is more suited for pasture, because, unlike native grasses and other exotic species, it can resist and adapt itself to semi-arid conditions and can be successfully introduced in areas with even 30 inches of rainfall. Buffel is much relished both by cattle and sheep in the green stage and also as hay.

PROPAGATION

Uncleaned buffel grass seed closely resembles that of *anjan*, but is light brownish in colour. The cleaned seed after removal of the hair is much smaller than berseem seed. Buffel can be propagated by raising the seedlings in a raised seed-bed and transplanting them after the break of the monsoon. Planting may be done in lines with a spacing of one foot × one foot. When extensive areas are to be planted, direct surface seeding at four to six pounds per acre will be necessary. Rootlets from established plants can also be planted after the rains have started. Buffel thrives better when grown with *jowar*, which serves as a nurse crop.

Buffel grows luxuriantly during part of summer and winter. To obtain a continuous supply of green forage for the greater part of the year, a mixture of buffel, *jowar* and sweet clover is worth trying. For this purpose, *jowar* and buffel may be sown in July, and sweet clover put in after the harvest of *jowar* in October. Besides giving more fodder, sweet clover will renovate the fertility of the soil which the exhaustive crop of *jowar* will deplete. Sweet clover is not affected by frost, and grows during winter and part of spring even with limited irrigational facilities.

The nutritive value of buffel as compared to other grasses is given below.

Grass	*Per cent chemical composition (on green basis)*				
	Dry matter	*Crude protein*	*Crude fibre*	*Calcium*	*Phosphorus*
Buffel	25·0	2·6	7·0	—	—
Anjan	25·4	2·0	7·4	0·29	0·37
Guinea grass	26·4	2·2	11·1	0·14	0·19
Sudan grass	35·2	1·4	11·3	0·33	0·15
Rhodes grass	32·7	2·9	10·6	—	0·23

HOW DENMARK ENSURES HYGIENIC MILK TO CONSUMERS

by
Bishamber Dass Bahl
Block Development Officer
Hissar

IN Denmark, the hygiene of milk and milk products is the responsibility of veterinary municipal doctors. About three million kroners (one kroner=about 75 nP) are spent on laboratories which test the milk produced all over the country.

Every farmer milks his cows in the morning between 4 and 5.30, and again at the same time in the evening. After keeping some milk for his home consumption, he cools the rest in a special cooler fitted in his dairy room. There is a contract between the farmer and the dairy: after keeping some milk for his own use, he must deliver the rest of it to the dairy. No cooling is required in the winter, when the temperature is mostly near freezing point and sometimes even below.

He collects both the evening and morning milk in well-cleaned milk cans, and leaves these cans on the main road near his farm before six in the morning. The dairy truck, which comes along at the scheduled time, takes these cans to the dairy. Nobody tampers with the milk cans while they are lying on the road.

The milk collected from different farmers is brought to the dairy daily before 8 a.m. in winter and 7 a.m. in summer. These dairies are generally situated in the villages or just near the towns. Most of them are co-operatives, some are private. From the dairies, the milk is supplied to the public after proper pasteurization and bottling.

Cream is checked for quality

When the milk has arrived in the dairy from each farm, samples are taken in one-pound bottles by health officials for testing in the laboratory, and also by the dairy milk tester, who is generally employed by the farmers; he tests the milk from each farm for fat percentage by Gerber's method, purity test and methylene blue test. The price paid to the farmers is according to the fat content of the milk and not according to its weight.

TESTS EVERY MONTH

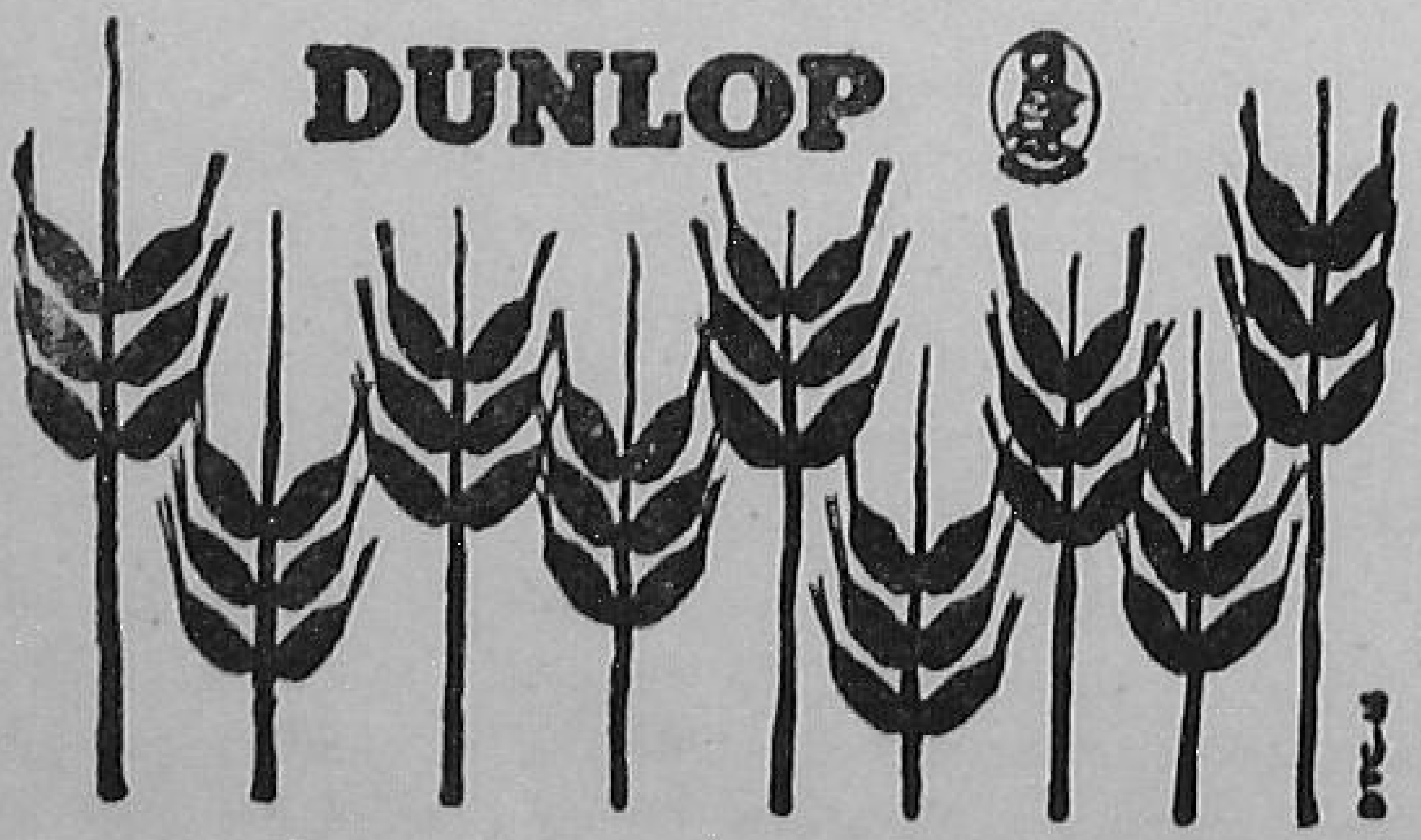
In the laboratory, four, or sometimes five, tests are taken of each farmer's milk once a month. These tests are: methylene blue test; bacterial count test (by growing in agar in petri dishes); adulteration test (with Dr. Bischoff's Lactometer and not Quenvenne's); test for streptococus and gas-forming bacteria; and the test for brucellosis.

Denmark has eradicated bovine tuberculosis since 1951—the first country in the world to do so. She is now trying to eradicate brucellosis as quickly as possible. The infection which was four per cent in 1945 has now dropped down to two per cent; they are expecting to bring it down even further very shortly.

This tyre lowers your farming costs

Tractor farming becomes easier with the Dunlop RT 33 open centre tractor tyre which has more tread bars to give the maximum grip on hard dry soils. This tyre reduces power loss on the tractor and enables a greater acreage to be ploughed per day.

More tractors in India are fitted with the Dunlop RT 33 Tyre than any other make

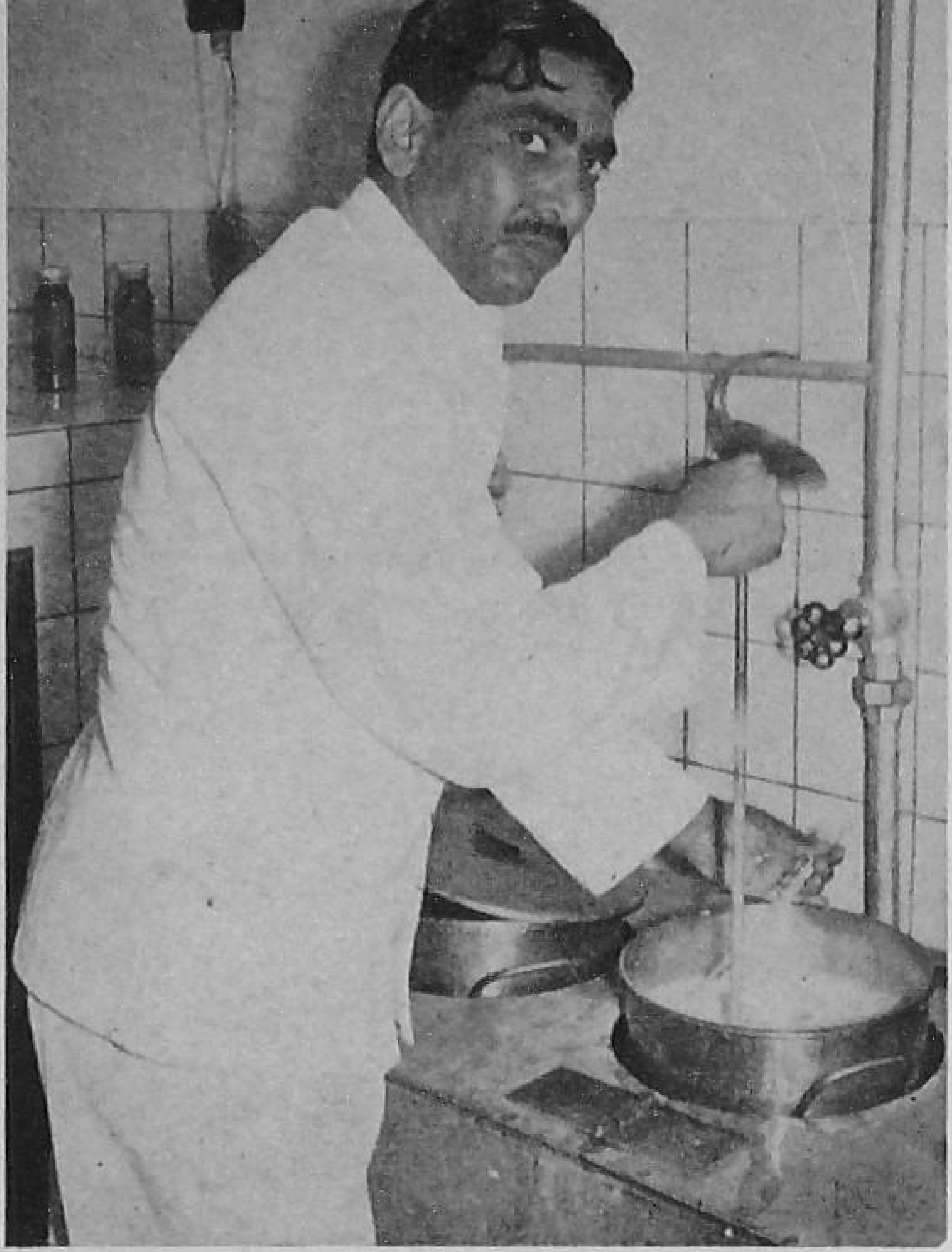


The milk test for brucellosis is a very simple one, unlike the blood agglutination test. About one c.c. of milk is taken in small test-tubes, and to each tube a drop of stained antigenic (Haimotoxine stained suspension of culture) is added ; the test-tubes are then kept in the incubator at 36°C for 50 minutes. If the sample is positive for brucellosis, a blue cream ring forms at the top of the test-tube and the milk colour is white; but if negative, there is a white ring of cream at the top and blue colour below. In addition to these tests of the farmer's milk, two tests are made of the dairy milk too. These are: (1) the test for preservatives, i.e., whether some preservative has been added to the milk by any dairy; and the test for heated milk, i.e., whether the milk was properly heated while being pasteurized and whether the enzymes in the milk have been destroyed. For the second test, they call it the "Fosfatase test" (Phosphatase test), they do not depend only upon Storch's test.

After a thorough examination of the milk in the laboratory if the veterinary doctor finds anything wrong with it, i.e., high bacterial count or high acidity, he goes to the farmer in whose milk he has found the defect. He examines the herd for mastitis and cleanliness, examines the utensils, the dairy room and the milking machine (in Denmark and Sweden, practically all cows are milked by machine) and tries to find out where the trouble lies. If he finds any cow suffering from mastitis, etc., he will direct the farmer not to mix her milk with the milk from other animals, and will ask him to get his animal treated.

The veterinary doctor, in addition to his laboratory work, is responsible for inspecting the dairy herd, dairy utensils, dairy rooms, milking machines, etc., of the farmer. He has to inspect 170 farms or 1,700 cows a month ; he can easily inspect 20 to 25 farms a day, if he has not to do laboratory work in the morning, which is generally done by the laboratory assistants, mostly women. If he has to do laboratory work in the morning, he visits the farms in the afternoon in his car, for which he gets a maintenance allowance from the local body whose employee he is.

The veterinary doctor, when he goes to the farm, takes some strips from all the four teats of each cow in a



Preparing starter for butter

small pail, which has a small dish fitted at the top about $1\frac{1}{2}$ inches below the edges of the pail ; this dish has black or dark blue surface and sides. On one side, the pail has a small handle like an ordinary mug, and on the other side, just above the dish, there is a small cell battery with a light. While he is stripping the cow's milk in this dish, the doctor puts on the light, by which he can easily detect the slightest change in the colour of the milk, i.e., whether the cow is suffering from mastitis, etc. When he moves to the next cow, he slightly tilts the pail, and the first cow's milk drops from the dish into the bottom of the pail through a small hole in the dish on one side. He does not have to throw out the milk, but collects it thus in the pail as he goes on examining the cows. If he finds any cow's milk defective, he tells the farmer about it and advises him not to mix this milk with the other milk, and to feed it to the pigs, etc., or to destroy it if it is badly affected.

CONVINCING THE FARMER

Sometimes, he uses a test to convince the farmer : he takes a filter paper on which small rings of about half an inch diameter are dried by an ordinary test of " alkoholish bromothymol blue " ; he drops the milk from the affected udder on these rings, which turn green in colour. Then he uses a healthy cow's milk on the filter paper, which does not change the crimson colour. The farmer gets convinced by this.

After inspecting all the cows the doctor inspects all the milk utensils, dairy room, milking machines, etc. This inspection is always a surprise inspection ; he does not inform the farmer about his arrival. After this thorough examination, he gives a dated slip to the farmer with his remarks and keeps a copy of it with him for record.

KONTROL ASSISTANT

The veterinary doctor is not expected to treat the farmer's animals. Nor does he give any advice regarding feeding or breeding of the livestock. For this purpose, the farmers' co-operatives have their own " kontrol assistant " who visits the farm once a month and gives them advice on the breeding and feeding of their animals according to the fat percentage of each cow's milk ; he also keeps proper milk and breeding records of each animal for the farmer. He is supposed to stay on each farm once a month for more than 24 hours. Regarding treatment of animals, the farmer consults the private veterinary doctor, who treats for all ailments, contagious or non-contagious. There are no municipal or state veterinary hospitals in Denmark.

Before milking, every farmer washes the udder of the cow with chlorine solution and dries it with cloth or towel. He strips the first milk in a separate pail, and then applies the milking machine to the four teats ; these first strips which have very high bacterial count are collected in a separate pail from all the cows and are fed to the pigs. The farmer daily washes his milk cans and other utensils with hot water and soda, and dries them with steam, and then rinses them again with chlorine solution.

CONTD. FROM PAGE 16

Infectious Diseases of Livestock

progress to develop a reasonably cheap and efficacious vaccine for large-scale use.

Prevention of widespread infectious diseases of livestock is a joint responsibility of the livestock owner, the veterinary surgeon and the government. Medicinal treatment for the cure of individual cases, besides being costly, is of little use for the control of these diseases. It is of considerable help to notify promptly the first cases of the outbreaks, to isolate affected animals from the healthy stock and disinfect infected quarters under the advice and guidance of the local veterinary surgeon.

KUTTANAD

The Rice Bowl of Kerala

by
N. S. Money

FOR about four months in the year, Kuttanad—known as the rice bowl of Kerala, is subject to heavy floods. Practically the whole of this area of about 337 square miles is about four feet below sea level. Four of the biggest rivers, besides many smaller ones, pour their flood waters into this area during the monsoon, submerging the land to a depth of four to six feet and depositing large quantities of silt. When the rainy season is over and the flood waters recede, sea water from the bar at Cochin floods the area, making it too saline for raising crops. And yet, paddy, which is one of the most important crops here, is cultivated under these unique conditions.

Indeed, paddy cultivation in this region is the most risky agricultural operation in the world. The cultivators grow paddy in fields surrounded by heavy mud embankments, outside which there is water standing five to seven feet above the field level. The waves constantly lash these bunds, breaking them down. At the close of the rainy season every year, these embankments have to be strengthened or laid down afresh. Seven to eight feet of water in the enclosed fields is pumped out before the new crop is sown. Only one crop is raised.

A large part of the cultivated area of this region represents land reclaimed from the Vembanad lake, one of the backwaters of the Arabian Sea. Below the soil surface, and in some areas even on the surface, there is a deep layer of peaty acid clay.

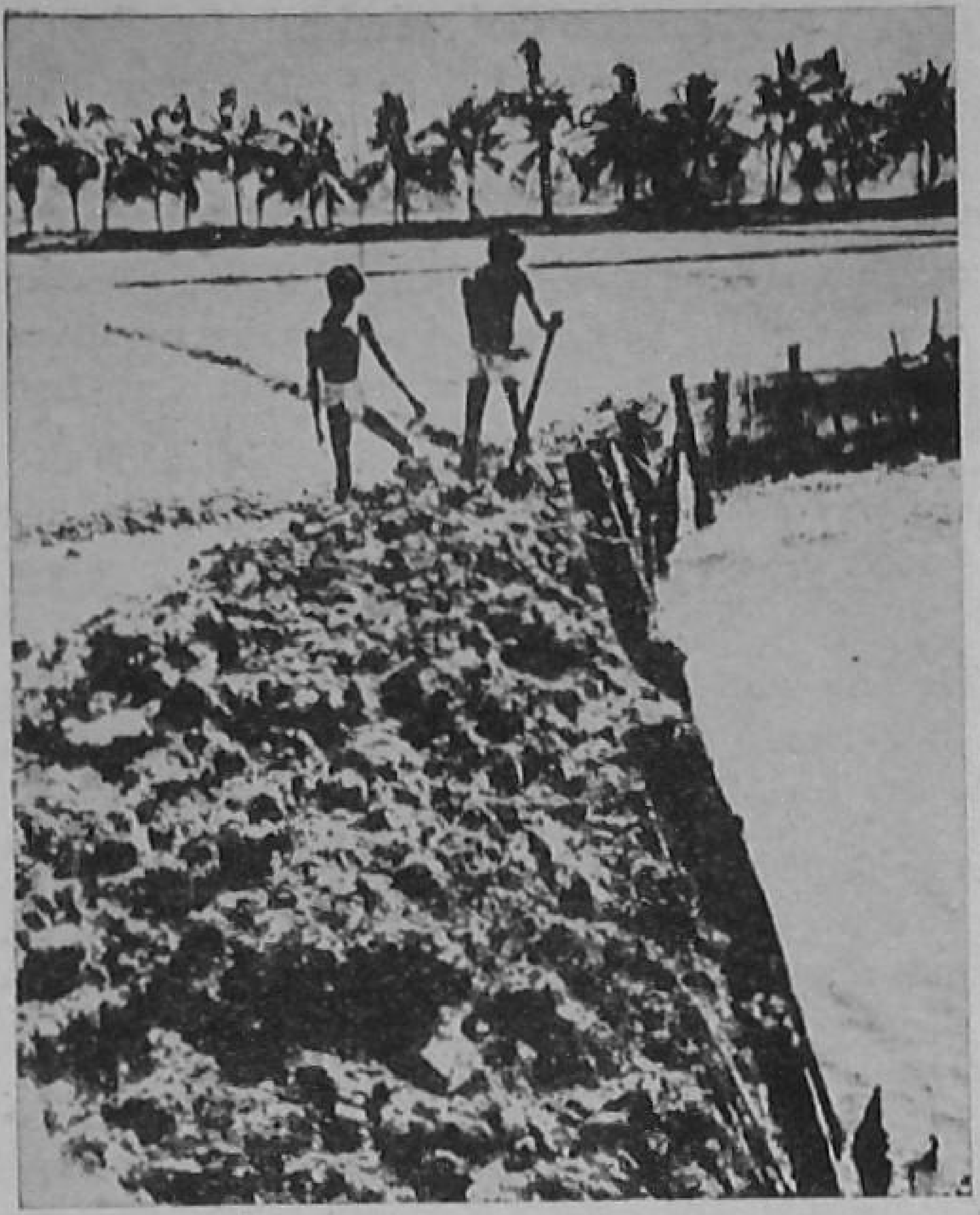
Another unique feature of the cultivation in the area is that co-operative farming is practised without its being recognized as such. Each block consists of 500 to 1,000 acres belonging to different individuals. The irrigation water must come from common sluices and dewatering has to be carried out by common engines, so the cultivators have to co-operate in the operations. The dewatering of the block (*padasekharam*) as well as the letting in of water are supervised and directed by a committee. The Punja special officer is in overall charge of cultivation. He settles disputes and arranges for dewatering, and collects each man's share of common expenditure.

TOPOGRAPHY

The paddy fields in Kuttanad fall under three categories.

Kara padams are situated on the banks of rivers and watercourses. The soils get enriched by the silt brought down by the rivers. The paddy plants grow luxuriantly, but the yields are not proportionately high.

Kayal lands are the fields reclaimed from the Vembanad lake and form the most extensive of the Punja lands covering about 20,000 acres. Reclamation, which dates back to 1836 A.D., was encouraged by Government concessions such as exemption from tax. Such lands reclaimed from the backwaters are eight to ten feet below water level. In the early years of reclamation, cultivation was carried on for two to four years continuously and the lands were then left fallow for one to two years. This practice



Ring-bunding of the fields is in progress

is known as *pazhanilam*. Yields have decreased in the last few years with the advent of continuous yearly cultivation.

Kari lands. Large areas of *kari* or peaty marsh soils occur in Kuttanad, most of it—about 10,000 acres—in and around Purakad in Ambalapuzha taluk. The cultivation practices are the same as those followed in Kuttanad. But crop failures are very common. Geological evidence suggests that in the past ships used to sail in this region.

If you visit Kuttanad soon after the monsoon you will see only a vast expanse of water. In a short time, the place will be transformed into a green expanse of paddy. During August-September, small islands come up in the area. Very soon the construction of bunds will be completed. These ring bunds, which surround an area of 500 to 1,000 acres, are made up of lake clay reinforced by brushwood or straw. It is a strange sight to see the clay brought up from ten to 12 feet below the water by expert divers. By and by the pumping units occupy their position and dewatering starts. The operations proceed round the clock. Each block or *padasekharam* has a battery of four to five engines of 25 to 50 H.P. run by electricity or diesel power. It may take three to five weeks for the water to go down to ploughing level (three to four feet).

Ploughing consists rather of mixing clay and water with the help of buffaloes which are made to wade or swim. Scientifically, this is ideal, as it serves to leach out the salt adhering to the surface soil.

SOWING BEGINS

In another week, sowing is done. Meanwhile, the seeds are put in *kaljan* baskets and immersed in water. The seeds are kept underneath water depending on the duration of the crop. They are then taken out and kept in a dry, cool place to allow germination. The sprouted seeds are sown in six to nine inches of water. Within two days the water is drained to enable the seedlings to take root in the soil. The field is kept dry up to six days.

Water is then let in through the sluices, and enters through the main channels and spreads through smaller channels. After two weeks, the so-called transplanting starts. The soil is colloidal and so loose that it is next to impossible for men or animals to trample in the field under low water level. Hence, this transplanting consists in throwing the seedling with the clay into places where there is a thin stand. Water is again let in and manures applied. During the period of cultivation, water is let in and drained two or three times.

Towards the end of the season, the entire area transforms itself into a township. On the bunds are established the threshing grounds and the abodes of the workers and owners. The entire harvesting is done within a period of two weeks, and in another fortnight the entire area again gets transformed into a lake.

It often happens that torrential rain causes floods and even breaking of the bunds. It is not unusual for the bunds to break due to high tides. Occasionally, the salt water enters the area and causes damage. Apart from these, soil conditions are also responsible for frequent crop failures. The production of acidity by bacterial and chemical oxidation of sulphur compounds is a peculiar feature of the soil. In spite of these handicaps, the cultivators carry on.

The Kerala Government has constituted a development board consisting of experts, officials and leading cultivators of the area to suggest betterment measures. The Kuttanad Development Scheme now under way is meant to solve the most important problems of flood and salt water entry. One stage of the scheme, namely, the Thottappally spillway is complete, and will help in reducing the flood havoc. The Thannirmukkam bund, when completed, will transform the entire area into a fresh-water lake, thus opening the way to a double crop over the entire area.

Planting Paddy

The Kudige Way

by

M. G. Ponnappa

ONE of the chief factors that help increase yield in the Japanese method of paddy cultivation is the use of intercultivators. If the intercultivator is worked both ways four to six times during the growth season, the yield goes up by ten to 15 per cent. These figures were obtained in trials conducted by me in the Ponnampet National Extension Service Block in Coorg district of Mysore, during the 1954-55 and 1955-56 seasons.

The cost of an intercultivator, which may work out to 50 nP per acre a year, is more than recovered by way of the saving in weeding expenses that is achieved by the use of this implement. Intercultivation with the Japanese weeder is very important to get the full benefit of the heavy doses of manure advocated under the Japanese method of cultivation. It stirs up the soil, providing greater aeration which results in better tillering, and buries in the weeds and algae which use up about 20 per cent of the manure applied to the crop.

Planting in lines is necessary for working the weeder in the tranplanted crop both ways as required. Transplanting by ropes, chains and frames, as advocated so far, is very slow and costly. About 15 women and two men are necessary to plant an acre using ropes; in Coorg, where people can plant very fast, it takes only three men to plant an acre in the ordinary way. It costs Rs. 15 more per acre to plant with ropes, chains or frames. This has been one of the biggest handicaps in popularizing the Japanese method. An alternative way of planting in lines sufficiently straight to permit the weeder being worked both ways is, therefore, desirable.

I have developed a method by which even beginners will be able to transplant as fast as by the usual method, without ropes, etc., and sufficiently straight to allow the working of the Japanese weeder both ways with complete ease. A good farmer who believes in the use of the intercultivator should not take more than one or two hours of practical training to learn this. Planting in almost perfect straight lines will also be possible with longer practice.

THE "KUDIGE" METHOD

The following are the main features of the Kudige method of planting, as it may be called.

Planting should be done in one direction only, starting from one end. When the man planting reaches the other end of the field, instead of planting round and round the field, as is the practice, he should come back to the starting point and continue.

One should not attempt planting more than four rows to get them in line within the cross-rows of one man.

The man who is following while planting his first row should see that he plants in line with the plants in the last row of the man preceding.

Some farmers plant left to right while others plant right to left. These methods must not be mixed up. Only one method should be adopted in a field. Whatever the practice, the first row must be close to some bund in the field. It is better to practice only left-to-right planting to get good lines.

If more than one person is planting in a field, all of them should adopt more or less the same distance both ways. To get this uniformity, it will be better if each group has as few people as possible.

If the fields are very wide or very long it, will be convenient to subdivide them for planting only (no bunds, etc., are necessary).

The bunds are not ordinarily straight. It will be convenient for beginners to plant one straight row lengthwise and another straight row crosswise near the bunds to get straight lines before they begin. After some practice, this is not necessary. The corners may be filled up later, keeping to the lines.

The method has been put to wider use this year at the Government Farm, Kudige, in Coorg district, using ordinary labourers who had not received any training before. The entire area of 50 acres of wet land at the Farm has been planted this way, giving a saving of about Rs. 750.

In a practical demonstration conducted at the Farm, labourers and trained staff, six in number, took only half an hour to plant an area of 50 × 15 yards—which works out to 19.5 man-hours an acre. Allowing for a lesser speed in longer periods of work, not more than 24 man-hours or three men will be required to plant an acre.

It is estimated that in Mysore alone, cultivators could save Rs. 75 lakhs by adopting this method.

For further information, the writer or the Deputy Director of Agriculture (Food Production), Seshadri Road, Bangalore, may be contacted.

What Makes For Quality in Farmyard Manure

by

R.S. Bhatty

FARMYARD manure, i.e., the excreta of farm animals mixed with the sweepings of farm stalls and sheds, is an all-round soil improver. Hence, its popularity with the farmer.

Unlike inorganic fertilizers, it adds organic matter to the soil, which contains almost all the essential plant nutrients and is a rich source of energy for the soil organisms. Organic matter imparts a dark brown colour to the soil, increases its capacity to absorb heat and to retain soluble nutrients, which would otherwise be washed down beyond the reach of the plant roots. Twelve tons of dung, it is estimated, supply three tons of organic matter containing about 140 pounds of nitrogen, 60 pounds of phosphate and about 100 pounds of potash. To keep farm lands in a condition of well-balanced fertility, application of farmyard manure is, therefore, essential.

Farmyard manure varies enormously in quality, and is far from being a standard product as shown below.

Kind	*Nitrogen*	*Phosphorus* (*per cent*)	*Potassuim*
Bullock-dung	0·62	0·26	0·72
Cow-dung	0·43	0·19	0·44
Horse-dung	0·54	0·23	0·54

The value of F.Y.M. is, however, much greater than can be measured in terms of the quantities of plant nutrients. Its physical effect on the soil structure cannot, unfortunately, be measured. The factors which influence the quality of F.Y.M. in regard to the three plant nutrients, i.e., nitrogen, phosphate and potassium, are discussed below.

The food consumed by animals undergoes great biochemical changes in their digestive tract. The digestible portion of the food is absorbed by the blood stream, while materials which resist digestion in the stomach are excreted as faeces and urine. Generally speaking, the composition of the food and the level at which it is given to the animal influence the quality of the dung produced. Chemical analysis has shown that concentrates like cotton-seed cake, oilcakes and other leguminous foods, because of their high nitrogen content, produce dung of higher manurial value in comparison to rations of low nitrogen content such as cereal straws and grains, hay and other fibrous materials.

Young calves and fattening animals utilize most of the nitrogen and mineral matter content of the food for building up muscles and bones, and produce dung of low quality. Similarly, in milch cattle, most of the nutrients pass into the milk. A dairy cow is known to use three times more nitrogen and phosphorus and about ten times more potassium than a full-grown bullock. Draft animals produce the richest dung at later stages of their life.

LIQUID PORTION

The liquid portion of the manure is by far the most important. More than 50 per cent of the nitrogen and 70 to 80 per cent of the potassium present in the food consumed by the animal reappear in the urine in a form readily available to plants. The other half of the nitrogen and almost all of the phosphorus are locked up in the faeces. Unfortunately, in India, most of the urine is lost due to the practice of keeping the animals in the open. Wherever animals are kept in stalls, urine should be collected in covered tanks at the end of the drains, or absorbed in cereal straw or other cheap material used as bedding. Litter serves two purposes: it absorbs urine as well as adds organic bulk to the heap.

Bacterial activity in the manure heap starts immediately after storage. Straw and other carbohydrate materials are broken down into a dark brown, structureless substance called humus. Humification is a slow process and takes place only under anaerobic conditions, i.e., when the manure heap is compact and excludes free circulation of air. At the same time, urea is fermented into ammonium carbonate which, due to its unstable nature, decomposes

into free ammonia. It is thus that most of the nitrogen is lost as ammonia, which gives a characteristic smell to animal byres. At one time, use of chemical compounds like gypsum and superphosphate was recommended to fix ammonium carbonate in the heap. But none of these compounds has proved useful.

LOSS OF NUTRIENTS

Loss of plant nutrients, particularly that of nitrogen, depends on the management of the pit during its preparation. Losses can be considerably reduced provided ammonium carbonate and soluble potassium compounds can be trapped in the manure pit. The greater the surface of the heap exposed to air, the higher will be the temperature and the greater the loss of ammonia. The manure pit should, therefore, be located on an elevated site in a covered yard or under the shade, and made compact to exclude air. A covered yard will also provide shelter against the leaching action of rain. The manure pit should be wet, but not too moist. The temperature should not be allowed to rise above 26°C.

In an experiment, losses of nutrients on storage were as follows:

	Loss of nitrogen per cent
Compact heap under cover	4
Loose heap under cover	7
Exposed heap	33

It should be, however, borne in mind that F.Y.M. does not supply plant nutrients in quantities sufficient to maintain high yields. It is particularly poor in phosphates. For successful farming, therefore, it should be supplemented by artificial fertilizers, wherever required.

* * *

101,000,000 TREES PLANTED IN U.K. IN ONE YEAR

Keeping the forests of tomorrow in temporary cold storage is only one aspect of the work being done at the recently opened £134,000 extension to the headquarters of Britain's Forestry Commission near Farnham, Surrey. Here, the commission is storing seed from countries all over the world. By keeping the seed in cold chambers at temperatures just above or below freezing point, according to variety, it can be successfully stored for periods of up to four years.

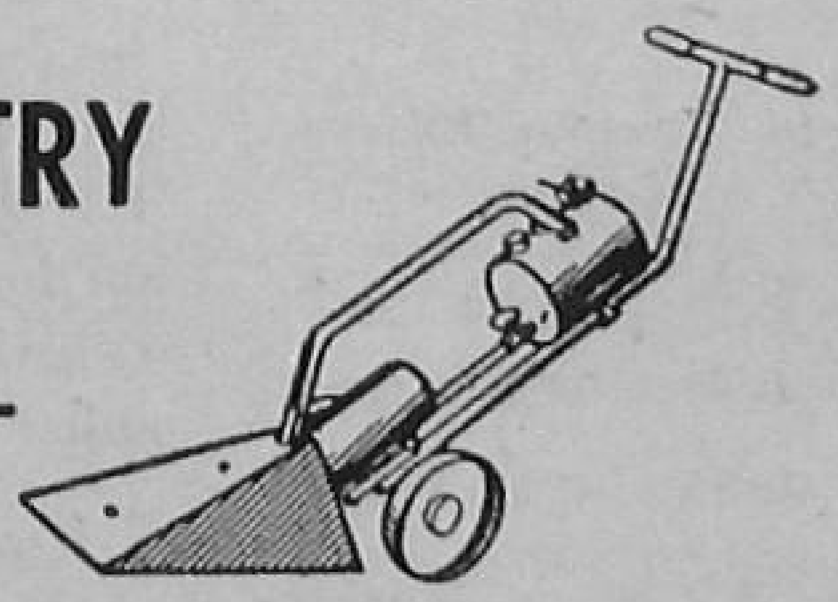
Last year, the commission planted 101,000,000 trees in Britain's forests, with a further 500,000,000 waiting in reserve in the nurseries. Research carried out by the commission will be greatly expanded as more and more land is acquired for afforestation. There are plans to add another half-million acres within the next ten years to the present forest estate of 1,225,000 acres.

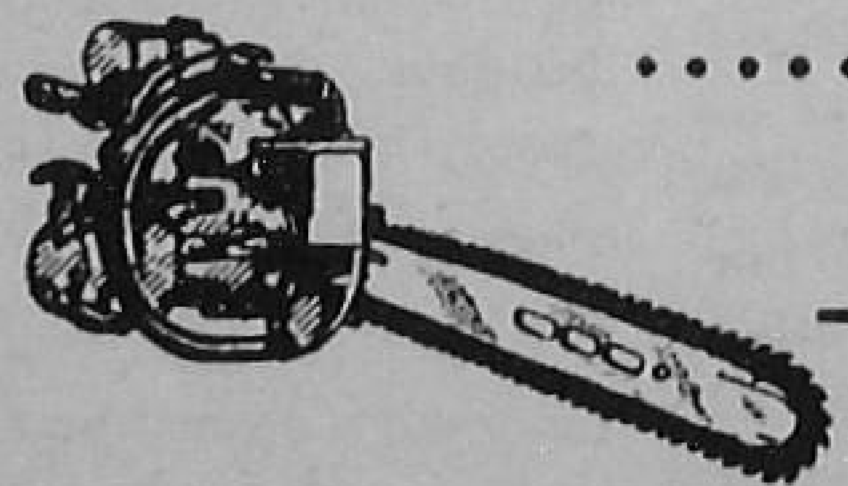
Commonwealth and world forestry will also benefit by this expansion, for the knowledge gained will be widely disseminated through such bodies as the Commonwealth Forestry Conference and the International Union of Forest Research Organisations.

FOR

AGRICULTURE & FORESTRY

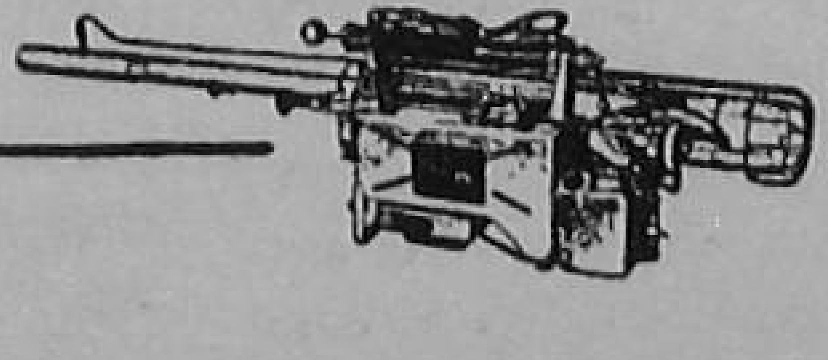
Mcallan FLAME GUN
HOODED MK. 24 Twin
Effortless control of Weeds and destruction of their seeds





JO-BU ***ONE MAN CHAIN SAW***
For high speed wood-cutting there is none to beat the "Jo-Bu" Junior Chain Saw—admirable for use on Tea Gardens; light in weight, only 23 lbs., and labour-saving

SWINGFOG
A SWINGFIRE PRODUCT
The ideal Applicator for Insecticides, Fungicides, Weedicides and Germicides



JARDINE HENDERSON, LTD. AGENCY DEPT. 4, CLIVE ROW, CALCUTTA-1

JM-2/9

Tea Cultivation in Kangra Needs Rejuvenation

by
Anup Singh Sandhu
Agronomist
Regional Research Centre, Oilseeds and Millets
Kanpur

OF the three important and widely used beverages—tea, coffee and cocoa, tea leads in consumption.

India exceeds all the principal tea-growing countries in tea production and export. The tea industry is India's second most important foreign exchange earner. During 1957-58, tea valued at Rs. 143.1 crores was exported from India. The industry employs about one million persons.

The tea plant, *Camellia sinensis* (*Thea sinensis*), is a bush or a tree belonging to the Camellia family. Tea came to be regularly cultivated after A.D. 740. The origin of tea is still a mystery. The oldest reference dates back to 2737 B.C. As regards its original home, there are two schools of thought. One, which favours China, argues that the oldest written record of tea is in the Chinese language. The second, which favours Assam, takes its stand upon the fact that the tea plant growing wild attains extra luxuriant growth in Upper Assam.

The first tea garden in India was planted in 1835 at Lakhimpur in Assam. This tea plantation failed, and another was established at Jaipur in 1840. By 1867, several acres of jungle land were reclaimed and planted with tea in Assam, Cachar, Sylhet, Chittagong, Darjeeling, Dehradun, Kumaon, Niligiri Hills, Chotanagpur and Kangra in Punjab.

In 1852, the first tea plantation in Kangra Valley was established at Holta near Palampur. The present Government Experimental Tea Farm is a part of it. By 1892, the total area under tea in Kangra Valley was 9,537 acres. In 1955, the total area in the Valley was 9,139 acres; the remaining area has been abandoned as uneconomic.

SOIL AND CLIMATE

Tea grows better in well-drained and loose sandy loam soils having a *p*H of 4.0 to 5.8. Tea, like tobacco, is influenced by the type of soil. A clay soil gives tea of a strong aroma and poor flavour. A black soil with high organic matter content gives a sweet taste and poor aroma to tea.

Tea requires a warm and humid climate with an annual, well-distributed rainfall of 100 to 150 inches. The temperature in the shade should never go beyond 95° F or fall below 55°F. The tea-growing season should be free of hot, dry and dusty winds and freezing temperatures. In the continuously hot and wet climate of Ceylon and Java, tea flushes throughout the year; in India, it remains cold and dry from October to March and hence the tea bushes do not put on leaves. In Kangra Valley, sometimes it is dry in April and May, which is not conducive to tea leaf production. Irrigation during such dry periods has been found very beneficial. In Kangra Valley, tea gardens are situated within the elevation range of 2,437 to 5,500 feet. Tea grows well in the foothills of the Dhauladhar range, i.e., between 3,000 and 4,500 feet. Beyond 5,000 feet, the yield decreases for want of sufficient warmth for proper flushing of leaves.

PROPAGATION

Tea is propagated by three methods: (i) sowing of seed *in situ*, (ii) transplanting of seedlings, and (iii) vegetative propagation such as by cuttings, layering and grafting. The first two methods are generally practised in India.

Sowing *in situ*. This is quite suitable for areas of excessive heat and drought during spring and summer, being quicker, simpler and cheaper. The seeds are collected from the bushes in November. After shelling, three to four healthy seeds may be dibbled *in situ*. Care should be taken that the scar or eye of the seed should face to one side in order to avoid curling of roots or stem at the time of germination.

Transplanting. To establish a good tea nursery the following points should be observed. The nursery

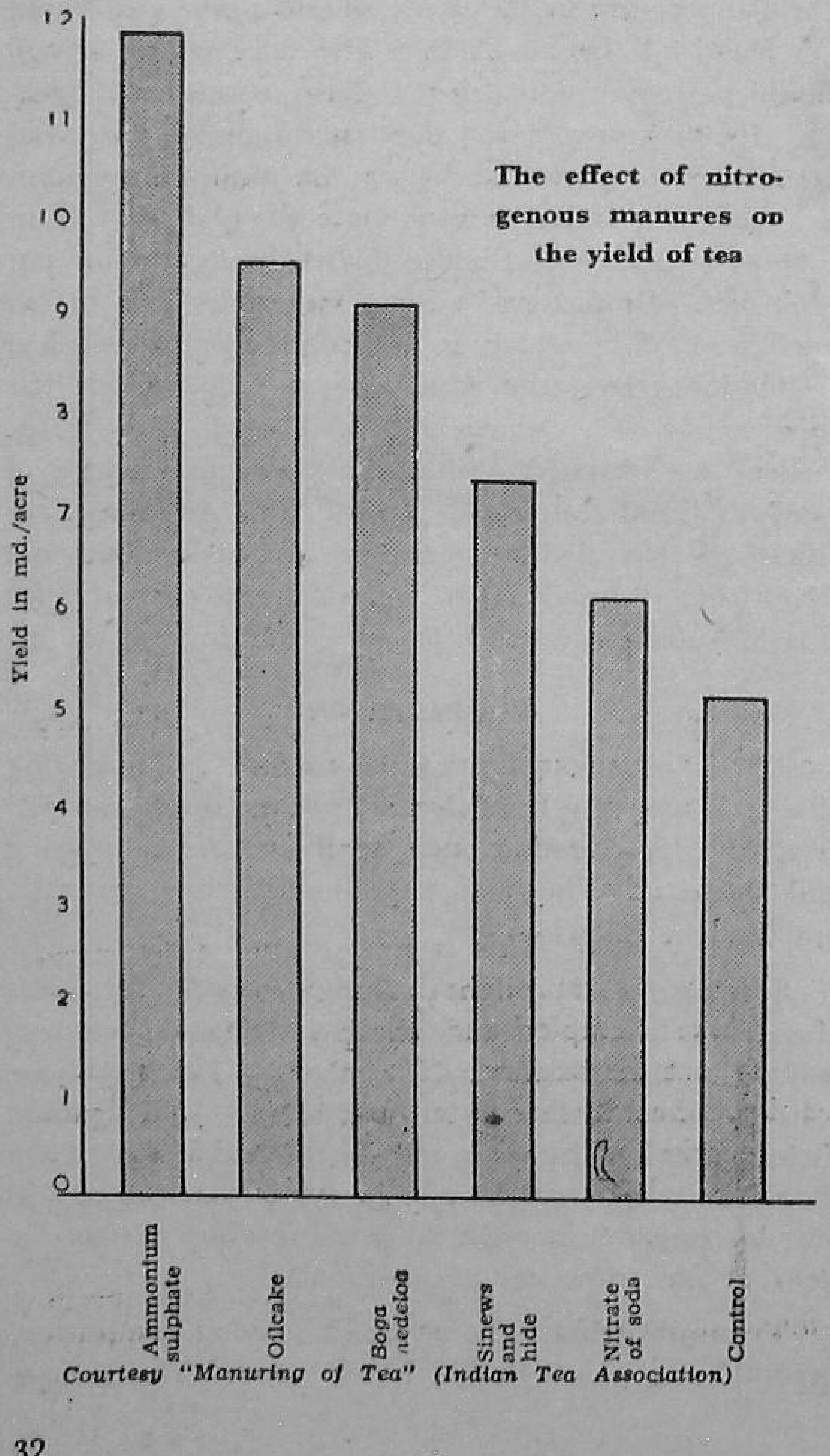
site should be near a perennial water supply. The nursery beds should have perfect drainage. Loamy soil should be preferred. The nursery beds should be protected from dry winds, and should be shaded for minimizing transpiration. They should be watered weekly during the dry period.

A nursery measuring 216 feet × 100 feet gives seedlings sufficient for 100 acres. The nursery may be sown in the month of November on well-prepared raised seed-beds. In June, five to six-inch tall seedlings are transplanted in 1½ feet × 1½ feet pits. Well-rotted farmyard manure should be mixed with the soil while refilling the pit.

Different spacings have been used in different tea soils. In Kangra Valley, spacings of 5 feet × 5 feet, 5 feet × 4½ feet, and 4 feet × 4 feet are common. After transplantation, the plant takes five to six years to reach the productive stage.

CULTIVATION

In addition to the destruction of weeds, cultivation at the proper time improves the physical condition of the soil, conserves soil moisture and helps the passage of water. Cultivation on slopes is extremely harmful in the absence of proper terracing and bunding accompanied by contour planting. Most of the Kangra tea gardens are on undulating land. Those tea planters who did not realize the importance of terracing and proper bunding have ruined their plantations. The soils have been completely depleted of plant nutrients and the yield has become very low.



The effect of nitrogenous manures on the yield of tea

Courtesy "Manuring of Tea" (Indian Tea Association)

Experiments conducted in Assam indicate that an increase in the number of cultivations and in the depth of cultivation have no effect on the yield of tea.

For mixing the manure, the soil is generally hoed with the spade round the bushes four times a year, i.e., before, during, and after the rainy season, and in spring. At the Government Experimental Tea Farm, Palampur, Kangra, it was observed that the spade hoeing done after the rainy season could be safely skipped. The hoeing during the rainy season should be very light. Only the soil should be scraped for suppressing the growth of weeds. During July and August, the months of the maximum rainfall in the tea-growing area around Palampur and Dharmsala (Kangra), the soil should be least disturbed, lest it be washed away.

MANURING

Tea is very responsive to nitrogenous manures. Its requirements of the three important macro-nutrients are discussed below.

Studies conducted by the Tockali Experimental Station of the Indian Tea Association on the effect of different forms of nitrogen have shown that ammonium sulphate is the most suitable source of nitrogen.

There was no difference in total crop response when nitrogen in an inorganic form was applied in any of the months of February, March, April, May, June, July, September and October. Application after June did not give its full effect in the same plucking season. Application in single or split doses did not affect the crop yield. The writer obtained similar results during two crop seasons, i.e., 1952 and 1953, in a manurial experiment conducted at the Palampur Tea Farm.

The continuous use of ammonium sulphate increases acidity in the soil, but helps the growth of tea plants, unlike with other field crops.

The yield per acre increases in proportion to the quantity of nitrogenous manure used. For Kangra tea plantations, 40 pounds nitrogen per acre as ammonium sulphate may be applied with advantage, or even 80 pounds for well-maintained tea bushes.

The fertilizer is generally hoed around the tea bush. Collar-pruned tea plants should be manured with ammonium sulphate at the beginning of the monsoon, when the tea bushes have attained some new growth. This will help in growth.

. A fall in the quality of tea has been reported with the increase of yield per acre. However, the moderate dose of 40 pounds nitrogen per acre does not affect the quality. Experiments conducted in Assam hardly indicate any need for phosphorus and potassium at the moderate rate of nitrogen application. However, with higher doses of nitrogen, the use of phosphorus and potash is considered desirable.

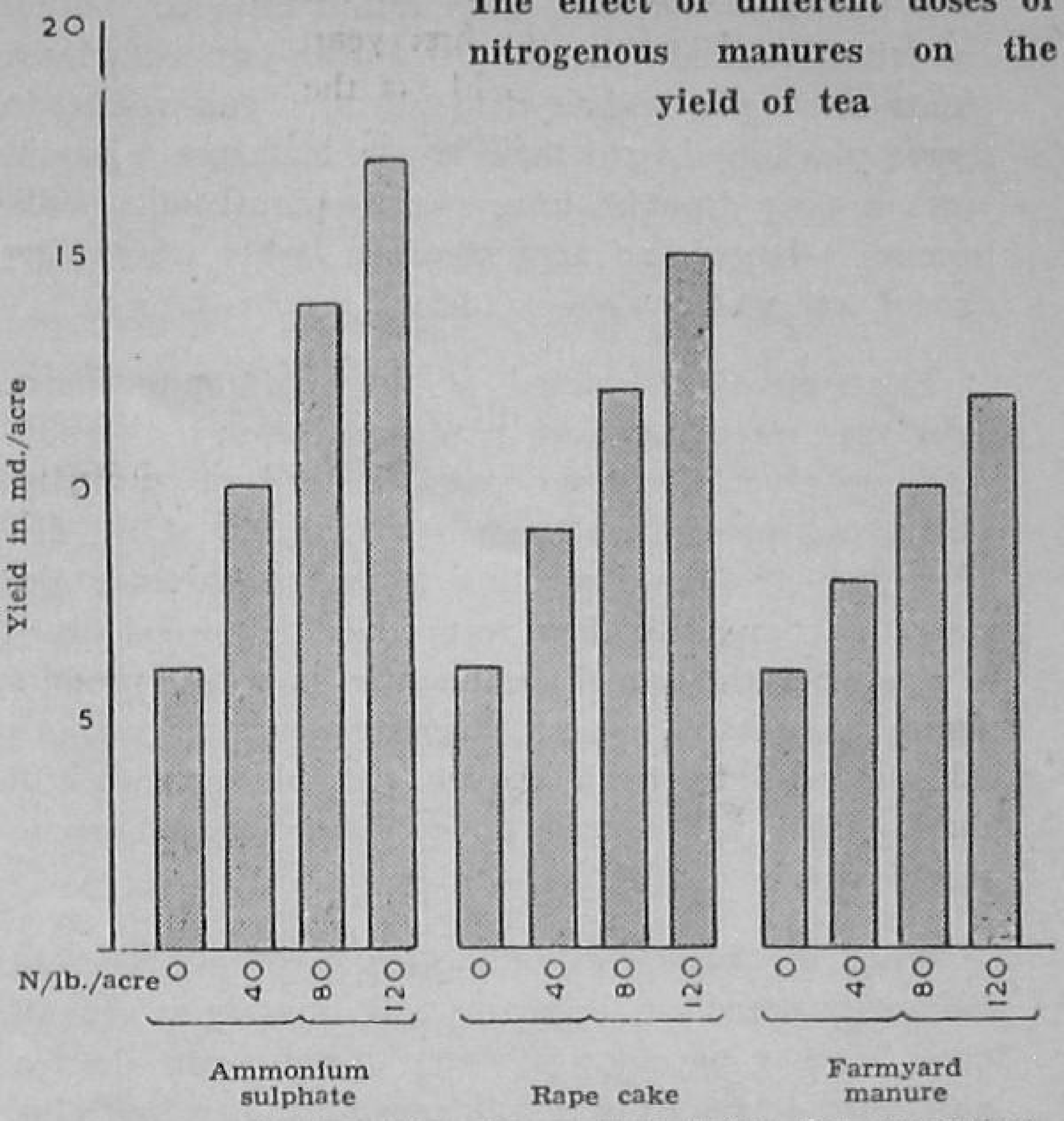
It is becoming a common practice to grow leguminous crops and trees in tea gardens. In new plantations, *Tephrosia candida* (*Boga medeloa*) is very useful. It helps cut on cultivation charges and expenditure on manuring. It is also very beneficial to grow *Boga medeloa* for two years on land in which tea plants are to be transplanted.

The leguminous crops mainly grown for green manuring in tea plantations are *Vigna catiang* (cowpea), *Phaseolus mungo* (*mung*), *Glycin soja* (soyabean), *Sesbania aculeata* (*dhaincha*), *Cajanus indicus* (*arhar*), *Crotolaria juncea* (sannhemp) and other species of *Crotolaria*. Generally, these crops are sown in March and April and then hoed in after about two months. Growing of the climbing types of legumes is not very desirable, because they hinder the plucking of tea. A low-growing crop hardy enough to thrive under the shade of tea bushes will enrich the soil, prevent soil erosion, suppress weed growth and minimize the necessity for cultivation.

Some leguminous trees are also used as shade trees in tea orchards. They are *Albizzia stipulata* (black seris or *oie*), *Albizzia proceva* (white seris) and other species of *Albizzia*, *Dalbergia assamica* (*Bor medeloa*), *Pithecelobium seman* (rain tree) and *Erythrina indica* (*dadap*). These shade trees protect the tea bushes from the scorching sun. They check the growth of weeds and soil erosion, and add a lot of organic matter to the soil through leaves and twigs. They make phosphoric acid and potash available for the use of tea plants. With leguminous shade trees, the necessity for manuring and cultivation is reduced.

Heavily shaded tea plants produce tea of inferior quality. Such tea may lack in flavour and strength of tea liquor due to the low tannin content. However, sufficient experimental evidence to support this belief is not yet readily available.

The effect of different doses of nitrogenous manures on the yield of tea



Courtesy "Manuring of Tea" (Indian Tea Association)

PRUNING

The object of pruning is to induce the tea bushes to produce more green, tender leaves. Pruning also ensures proper height and shape of the tea bush for rapid and accurate plucking. Generally, tea bushes are kept 18 to 36 inches high. The experiments conducted at the Palampur Farm indicate that 18 inches is better than 24 and 36 inches.

In pruning, all the suckers should be cut close to their point of origin. All the seed-bearing branches and their shoots should be removed. While pruning each branch (a) remove red and green wood; (b) cut the branch so as to have new wood of about the thickness of a pencil and one inch long left above the previous year's pruning; (c) cut in such a way that the ends of pruned branches are not closer than three inches to one another; (d) knotty and rotten portions of the wood should be removed. Cutting of the central branches of the bush should be avoided because it is these branches which help in the spread of the bush. In order to encourage maximum coverage of soil, spare the outermost branches. However, the flower or seed-bearing outer branches may be lightly pruned.

Pruning of newly-planted tea plants should be avoided. The young tea plants need sufficient leaf area to manufacture their food requirements.

Sometimes vigorous and well-maintained bushes are left unpruned. In the first year, unpruned tea plants may give higher yield, as they can resist too coarse plucking due to their larger leaf area. But in years of early drought, unpruned tea plants suffer badly because a larger leaf area means a larger transpiring (giving off water-vapour) surface.

Experiments conducted at the Palampur Farm show that tea plants may be pruned every alternate year, or even after two years, instead of annually. This way, production costs come down. One disadvantage of annual pruning is that it exhausts the plants by compelling them to produce new wood every year, whereas they could use the same energy in producing more pluckable leaves. Pruning at greater intervals will also result in much less knots in the framework of plants—there will not be an easy flow of cell-sap in knotty wood.

When the framework of the tea bush gets very old and badly damaged, collar pruning (cutting at ground level) becomes necessary in order to rejuvenate the tea bush. Before resorting to collar pruning, it is desirable to have applied the optimum dose of nitrogen in the previous two seasons; this will enable the plants to withstand the shock of heavy pruning.

Observations made at the Tea Farm, Palampur, suggest that heavily pruned bushes should be given one irrigation during dry periods in April and May. This will enable the plants to put on some new growth and to have a good start at the commencement of the monsoon. Forty pounds nitrogen per acre as ammonium sulphate should be applied to the pruned bushes. This will help the plants build up a good framework of branches.

Early pruning is to be preferred, starting in November and continuing up to the end of December. Delay in pruning results in low yield.

PLUCKING

The plucking season is from March to November. But in cold places it may be shorter. In Kangra Valley, it seldom goes beyond September. It is necessary to leave sufficient leaves on the bush. Heavy or coarse plucking should not be resorted to, lest the plants starve and die off.

Plucking is best done by hand, because only tender leaves are to be plucked. In Japan, attempts have been made to pick or harvest tea leaves with scissors. It has been claimed that by this means a ten-fold increase in the daily output per worker is achieved, i.e., 350 pounds as compared to 35 pounds for hand-picking. With this method of harvesting, however, it is not possible to exercise any control over the quality of tea, because with scissors it is difficult to make a selection of leaves. The coarser leaves will lower the quality of tea.

Generally, three grades in plucking are recognized:

Fine : Two leaves and a bud

Medium : A bud and two leaves, plus the soft portion of the third leaf

Coarse : A bud and three or four leaves, including the stalk

It is estimated that plucking three leaves and a bud will give 60 per cent more yield than plucking two leaves and a bud. But, with coarse plucking the quality of tea will fall.

YIELD

The average yield per acre in Assam is 955 pounds. The Darang district of Assam recorded a figure of 1,170 pounds of manufactured tea during 1955. A yield of 1,600 pounds per acre has also been obtained. The lowest average yield of 107 pounds per acre is in Himachal Pradesh; next comes Punjab, with 223 pounds per acre.

The average yield of tea per acre in Kangra Valley is extremely low. The main reasons are: (1) The tea plantations are more than 100 years old. Hence, the tea bushes are not very productive. (2) As a result of negligence, a large number of tea bushes have died. (3) There is inadequate use of fertilizers. (4) Defective methods of pruning, plucking and the absence of proper soil conservation practices such as terracing, bunding and contour cultivation are the other causes.

The immediate problem facing the Kangra tea plantations is to explore ways and means to raise the present level of tea production with the existing tea bushes. The economic life of the tea plant is said to be 60 years. But in Kangra Valley, the experience has been that even 100 years old tea plants can easily be rejuvenated by collar pruning, followed by improved practices of cultivation, manuring, pruning and plucking. Progressive tea growers of the Valley who follow improved practices of tea culture are getting an average yield of 450 to 500 pounds of tea per acre.

In order to save the tea industry of this Valley, refilling of the gaps in the tea plantations and re-planting have to be taken up immediately. As the quality of tea produced in the Valley is also very poor, the immediate establishment of a tea research station for tackling local agronomic and manufacturing problems of tea is also called for.

A Good Service Programme Makes Farm Machinery Live Longer

by
R. P. Saxena
Assistant Agricultural Engineer
Lucknow

HOW can the farmer make his machinery last longer ?

When a piece of machinery is purchased, the farmer chalks out a programme for its care and maintenance. In most cases, he is very particular about cleaning, tightening bolts and nuts and oiling the parts; but slowly he loses his interest, probably with the fading of paint and wearing out of the implements.

As an Agricultural Engineer, I have tried to tackle the problem and feel that if certain precautions are observed, farm machinery can be made to go a longer way.

The key to longer machinery life in general lies in a good service programme.

BULLOCK-DRAWN EQUIPMENT

Since bullock-drawn implements do not work at high speed and are not subject to greater loads, lubrication through oil holes or grease cups is satisfactory. Frequent stops should be made at regular intervals in the field and oil poured through the oil holes with the help of an oil-can.

Some of the parts of the so-called improved types are made of wood, felt, leather and other perishable materials. Therefores, they should be protected from rain and sun and stored under a shed, for the weathering effect causes buckling, retening and deformation of such perishable materials.

Tightening of nuts and bolts is not only essential for the long life of the machinery but also good for trouble-free operation. The other fastenings like split pins, screws and wedges should always remain perfectly in place and be quite tight.

The worn-out parts should be replaced with the repaired or new ones as soon as possible. This will reduce draft and the wear on the other components.

Implements like seed-drills and winnowers should be thoroughly cleaned of the grain so that rats and weevils may not damage parts made of canvas, leather and felt. It has been observed that farmers leave the seed-drill uncleaned after the sowing season and the remaining grain in the seed-box is reduced to flour by these insects which somehow absorb moisture from the air; or if the implements are standing in the open, the rain water gets in through the joints, and the flour sticks on the parts—thus reducing the life of the components and the implements.

Generally speaking, blacksmiths and carpenters are not in a position to adequately repair the improved implements. However, cheap spare parts are available indigenously, and worn-out parts may be replaced with these.

It is a common sight to see implements dragged from the field to the house behind the bullocks. This practice leads to permanent deformation and breakages of some parts, which shortens the life of the implements.

POWER AND TRACTOR-DRAWN EQUIPMENT

There is no short-cut to the problem of lengthening the life of tractor and power machinery. First and foremost come lubrication and minor repairs. It is important to use good quality high-grade oil and greases in accordance with the recommendation of the oil dealers. One must insist on stable oils that will not thin out under heat and cause corrosion of walls and piston rings and give carbons, sulphur, gum and tarry substances, and at the same time will not fail to provide a thin oil film between the moving parts. Better

quality lubricants and greases will not oxidize and dry out. They will not cause overheating of bearings and increase in power consumption. The expense and time invested in good lubrication pay larger dividends. It is useful to remember that "oil is cheaper than metal."

For modern types of tractors and power-drawn machinery operated at higher speed, the following classes of oil and greases are required: a good motor oil for the crank case; a good chassis lubricant for pressure gun; a good gear lubricant and a good rust preventive.

Farm machines travel slow, but the moving parts, particularly of mowers, harvesters and threshers, operate at higher speed. The wear and tear is rapid unless a good lubricant is used. Therefore, agricultural engineers recommend that machines having high-speed moving parts such as mowers, binders, combines, etc., should be stopped in the field every two to four hours and greased. Pressure gun lubrication only should be used, as it forces the lubricant into the bearings and drives out the old, dirty gritty grease through the clearance space, thus causing less wear on the machine and resulting in good performance and prolonged life.

Many a time it has been observed that due care is not given to the implements like ploughs and cultivators. Their operation in stony, stumpy and bushy soil leads to breakage, thus shortening their life.

TIMELY REPAIRS

Timely repairs are very essential. After every operation, the machinery should be thoroughly checked for any type of breakage, loss of bolts and nuts or for parts dropped in the fields. The owner should keep a good stock of assorted sizes of bolts and nuts and a number of midget-pressure type fittings of 1/4 inch diameter, 28 inches thread, since this is the most common fitting used in pressure lubrication.

During the maintenance of the equipment, examine the parts carefully for developing cracks or deformation. Keep the machinery in good trim by tightening bolts and nuts and effecting proper adjustments. Too tight chains, canvases and belts cause rapid wear of bearing and the parts themselves. Safety devices that get stuck will not function when the machine encounters any obstruction. Plough hitches adjusted too high cause rapid wear of the share point, requiring repointing or a new share. Mower cutter bars that have no lead or are out of adjustment may caus break-age of the knife and reduce the life of the machine.

Since power-drawn implements are rather complicated and composed of many delicate parts, it is a good practice to exercise a check on the equipment and obtain new spares for the parts which have crossed wearing limits. This should invariably be done after every operational season to ensure trouble-free operations for the ensuing season. Replacement, seasonal check-up and overhauls are of great importance. Care has to be exercised while making replacement. It is a good practice while changing the bearing to also change its cage. In case a shaft has been changed its bushing or bearing, if worn out, should also be replaced. While making the change, carefully keep in view limits and tolerances. Bolts are to be tightened down to the recommended pressure.

Neglect in overhaul over a long period causes excessive wear and cuts short by many hours the efficient life of the equipment; hence, timely overhauls should be attended to under expert guidance well in advance.

The annual overhaul plan should be carried out in consultation with the farm machinery dealer from whom the equipment has been purchased, since the dealer keeps factory-trained expert servicemen who will do the job according to the original specifications.

CARE IN STORAGE

Very few implements are at work for more than a few weeks in a season. Therefore, when the implement makes its last trip from the field, it should be carefully gone over for repairs and adjustments. Necessary repairs and adjustments noticed in the field must be written down in a note-book kept for this purpose. The needed spares should be ordered for and service jobs attended to. The safe storage preparation then may be started. To prolong the life of the machinery at the time of storage and to avoid absorption of moisture, wash out or sweep out all remnants of fertilizers and grain accumulation from the manure spreader and grain drills. The weeds and trash found around the axles may also be removed completely and the machine may be dried and cleaned; then, apply warm linseed oil on all wooden parts and rust preventives on iron ones. All types of tractors and self-propelled machinery like harvesters and threshers should be well protected by thorough inside lubrication of the cylinder wall mechanism, etc. The instruction book of individual machines may be consulted. Enclosed chambers may be drained and flushed. The knotter mechanism of bailers and grain binders, and corn binders need to be protected against rust, especially where they have been polished by the twine.

All machines equipped with rubber tyres should be jacked up. Oil, manure and fertilizer in contact with the rubber should be separated.

Livestock which may cause damage, especially she-buffaloes, should not be allowed near the machines.

Chicken and pigeon droppings may quickly corrode metal parts; hence, these birds should not be allowed in the shed.

All perishable parts such as canvas, belt and other delicate linkage be kept dismantled, and may either be packed in a box or the parts be wired.

The implements should be cleaned and painted. This practice gives the owner a feeling of pride and saves the parts from damage due to rust and rot, thus cutting on the cost of maintenance and giving longer life to the machines.

Starting stored machines needs careful attention. The following procedure should be adopted: the machine may be cleaned with kerosene and other solvents to remove protective coatings. All the perishable parts and the attachment wire should go on the proper place, and all parts which were neglected during the slack season should be given attention.

The machine should be lubricated completely and a thorough check carried out; old oil should be flushed and parts greased. If the machine has been stored outside, it is advisable to flood all moving parts with kerosene to cut rust. Dirt should be flushed with pressure lubrication and the machine operated to see that all parts are running freely and that bearings do not heat up. In case of difficulty, consult the machinery dealer or the instruction book.

The soil must be fed before it can feed man. A famished soil is a spent force. At "Alembic" we are in touch with the latest developments in fertiliser chemistry, and so are able to offer India's farmers and their "hungry" land a "chemical food" that it vitally needs—ALCHEMPHOS, a mixed fertiliser and first-rate nutrient which enriches the soil and ensures an abundant yield.

a mixed fertiliser for
potatoes and onions,
vegetables,
dal and seeds,
tobacco,
wheat and other crops,
maize, beans, etc.
sugarcane,
fruit trees,
cotton plants and jute.

ALCHEMPHOS

ALEMBIC CHEMICAL WORKS CO. LTD., BARODA-3.

You can put your confidence in Alembic

The Advantages With Gliricidia

by
A. S. Venkata Rao

GREEN manures are the cheapest of organic manures. Green manure plants are of two kinds: seasonal and perennial. Indigo, *dhaincha*, sannhemp, *pillipesara* are all seasonal, while *Pongamia*, *neem*, *Albizzia*, *Gliricidia maculata* and others are perennial varieties.

The seasonal varieties are cultivated just before they are needed. But the cultivation of seasonal types is not convenient when the seasonal rain fails, nor for farmers who have small holdings of land and have to raise crops continuously.

This is where perennial green manure trees come in handy. Take *Gliricidia maculata*, a quick-growing shrub originally introduced from abroad. Its manurial value compared to other green manure trees is very high. The manurial value of *Gliricidia* cuttings is estimated as follows:

	Per cent
Nitrogen	2.9
Phosphorus	0.5
Potash	2.8

In 1949, *Gliricidia* seeds were obtained from the Agriculture Department, Madras, and sown in my field. From 1951 to 1953, I used the leaf cuttings as green manure for paddy.

The leaves and stalks rot quickly and become plant food. Three thousand pounds of *Gliricidia* cuttings per acre are equivalent to 250 pounds sulphate of ammonia, 100 pounds superphosphate and 100 pounds muriate of potash (or 50 pounds nitrogen 16 pounds phosphoric acid and 54 pounds potash). By using the *Gliricidia* green manure, the farmer can save nearly Rs. 75 per acre. The yield of paddy goes up by 40 per cent.

Gliricidia grows very quickly to a height of 20 to 25 feet with long branches. It has an abundance of leaves of dark green colour. The leaves can be cut from the second or third year. A full-grown shrub can give 30 to 100 pounds of green leaf.

This shrub can be propagated from seeds or cuttings. Planting from seedlings is more successful than from cuttings. When seedlings are raised in pots, practically all of them survive, compared to seedlings raised in beds. *Gliricidia* can be planted on the border of the field or in groves in waste lands. Three hundred plants can be planted on the borders of every acre with a spacing of five feet between seedlings. Watering is necessary at regular intervals until the seedlings are well established.

Here are some of the advantages of *Gliricidia*.

The leaves give good manure and the stems serve as fuel. Animals do not eat the leaves.

It serves as a wind-break on the borders of cane, betel and plantain fields.

It protects from drought and reduces the water requirements.

As the roots go deep and the leaves are cut very often, the crops are not deprived of sunlight.

It reduces our dependence on inorganic fertilizers.

It can be grown in any soil easily.

U.S.S.R. EVOLVES NEW IRRIGATION TECHNIQUES

by

M. Pavlov

DURING the next seven years, the land under irrigation in the Soviet Union will be increased by 1.9 million hectares (a hectare is equal to 2.5 acres). This increase alone is almost twice the irrigated area of a country like Iran. But the development of irrigation in the USSR is not limited to this alone. The Plan calls for watering nearly 80 million hectares of pasture lands in desert and semi-desert zones. At the same time, drainage in areas with superfluous moisture will be carried out on 3.6 million hectares of swampy and marshy land.

The irrigation and land melioration programme of the Soviet Union is being carried out in such a way as makes it possible to introduce advanced methods of work, progressive technology and mechanization of production processes.

The following can serve as an example of how this is being put into practice.

ADVANCED SCIENCE AND PRACTICE

State Farm No. 4 occupies 10,400 hectares of newly-developed virgin land in the Hungry Steppe of Kazakhstan. The project of Soviet scientists and melioration specialists envisages the creation of a technically perfect system of irrigation here to facilitate the achievement of high economic indices with minimum expenditure of labour.

In drawing up the project, the configuration of the ground and soil conditions have been taken fully into account. The state farm's area has been divided into five sections, each of which will have its own irrigation pattern. In order to cut down wastage of water due to filtration, beds of large canals will be compressed with ground compressing machines, and will also be covered with concrete. With the same aim in view, a closed distributive irrigation network on a considerable tract is to be replaced by an open one. Special asbestos and cement pipes will be laid. They will be placed at a distance of 600 metres from one another, and hydrants, installed 120 metres apart, will supply water to temporary ditches. In one of the sections, where the relief prevents the flow of water by gravity, the pipeline system will be reinforced by a pumping station. It will guarantee the needed water pressure.

The technique of watering farm crops is also being changed. Spray irrigation, with machines produced in Soviet factories, is being introduced on a considerable part of the land. The spray machines will be of both stationary and mobile (tractor) types. From the results already obtained, it is clear that spray irrigation increases labour productivity several times, as compared with ordinary furrow irrigation.

The remaining part of the state farm will be irrigated from open concrete-covered canals, but with the aid of portable pipes, which are briefly described below.

MECHANIZATION OF WATERING

In the Soviet Union, furrow irrigation is usually employed for cotton and other row crops. The backward and old flooding irrigation method has been abandoned. At present, one man, depending on the relief of the land, can irrigate from 0.5 to 1.2 hectares of crop land a day. Such labour productivity can hardly satisfy any large farm. The Soviet specialists have, therefore, introduced in various irrigation areas of the country a new method involving the use of flexible, portable pipes made from plastics or cotton fabrics impregnated in an appropriate solution. Such pipes take the place of temporary irrigation ditches and distributive furrows. The pipes have openings from which water is supplied to the furrows.

Special water installations have been set up, which include soft pipes 350 to 440 millimetres in diameter and up to 1,000 metres in length for delivering the water. To these are attached pipes, 190 to 350 millimetres

in diameter and 200 to 350 metres in length with frequent outlets.

Of importance, too, is the fact that devices have been worked out for tractors, which have made it possible to mechanize the laying of thin pipes. A set consisting of three sections of soft pipes can irrigate 24 hectares in 24 hours, consuming 200 litres of water per second.

The state farm plans to make extensive use of the soft pipes in supplying moisture to its crops. It has been estimated that the introduction of technically perfect irrigation systems will make it possible to increase the efficiency of the irrigation network from 0.63 to 0.90. Economy of water, as compared with the existing irrigation technique, will amount to 330 cubic metres per hectare.

It should also be noted that in this farm, as in other irrigated areas of the USSR, a drainage system is being introduced for draining subsoil waters and preventing soil salinity. The total length of the closed drains in the state farm will come to some 223 kilometres. Besides, the project envisages the development of 253 kilometres of shelter-belts. They will fringe fields, canals and roads, helping to prevent the evaporation of moisture.

Our experience shows that the new irrigation method described above makes it possible to increase the irrigated area by five to six times inasmuch as it eliminates the necessity of cutting irrigation ditches. It yields also a big economy in water-consumption and increases labour productivity by three to five times. There is no doubt that the new method will help raise the technical level of Soviet agriculture.

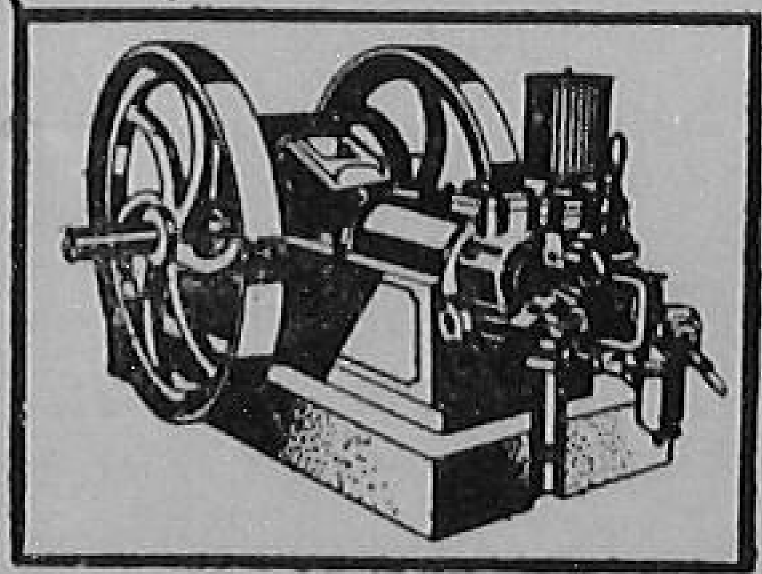
NEVER RAISE A LOAN...

CE. 107

"Never raise a loan" is a good dictum handed down from father to son. Yet, every rule has an exception.

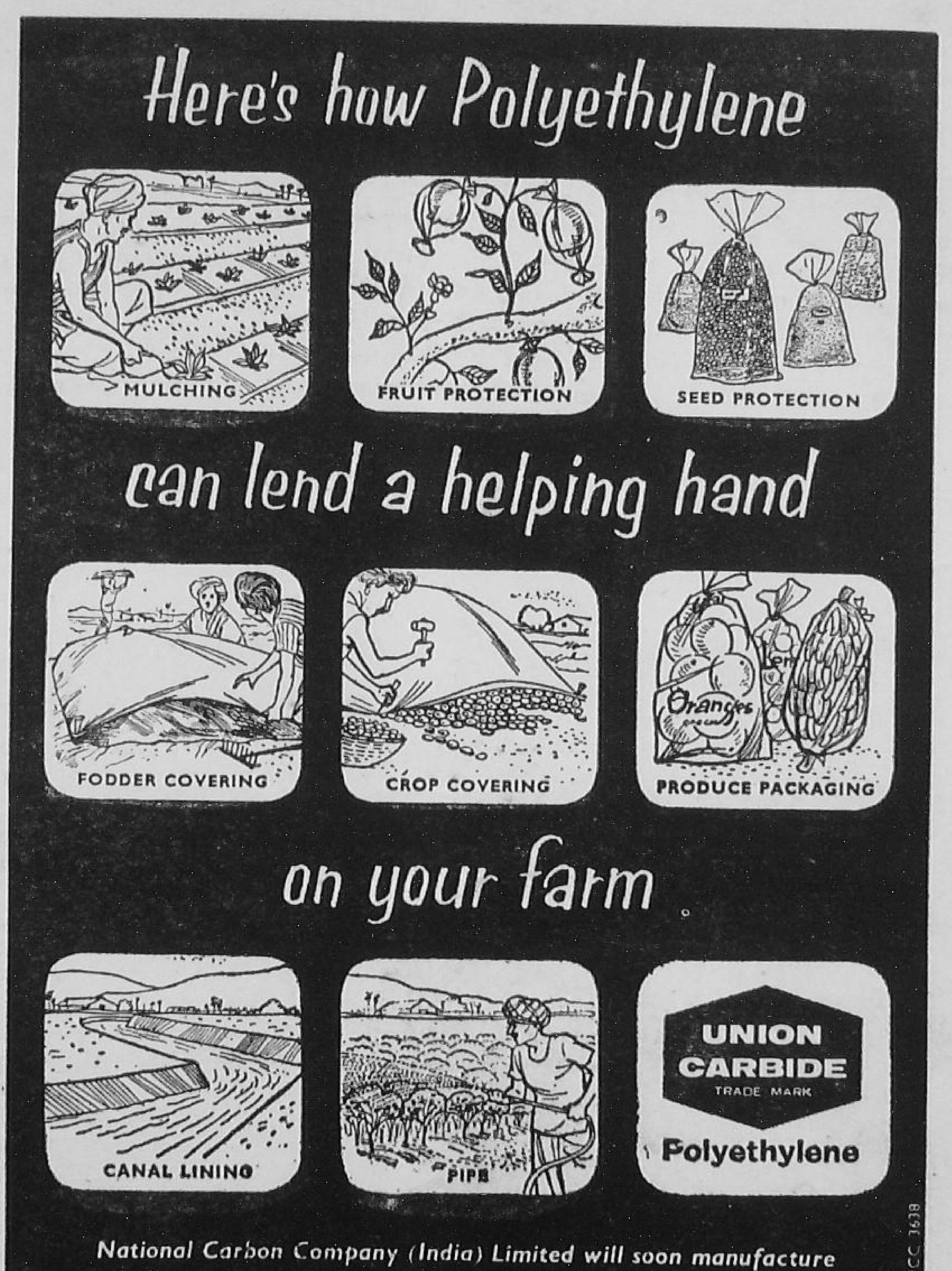
Under the auspices of India's Five-Year Plans, Government has introduced a number of Community Development Projects. Innumerable farmers are today taking advantage of the assistance the Government is rendering, in the shape of Takavi loans, to purchase farm equipment.

Acquiring a Cooper Diesel engine from these loans gives a vital impetus to food production in this country, for, with a Cooper Diesel engine, fields can be well watered and abundant crops raised quickly. The loan can then be repaid in no time. Big crops are the best contribution a farmer can make to the success of the Community Development Projects.



Cooper Diesel Engine — Part and Parcel of the Farmer's Life!

COOPER ENGINEERING LTD.
Satara Road, S. Railway



Printed at NATIONAL PRINTING WORKS
(THE TIMES OF INDIA PRESS), 10, Daryaganj, DELHI.

Regd. No. D. 571

Genuine Spare Parts For

FERGUSON
MASSEY-HARRIS
MASSEY-FERGUSON
TRACTORS & IMPLEMENTS

are available only from officially appointed Distributors and Dealers

MASSEY-FERGUSON (INDIA) LTD.
BANGALORE

Incorporated in the United Kingdom Liability of Members Limited